28 DEC 93 15:09:23 U.S. Patent & Trademark Office P0001

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  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *                                                               *
  *          Welcome to MESSENGER at USPTO                        *
  *                                                               *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *    The USPTO production files are current through:            *
  *     28 DEC 1993 for U.S. Patent Text Data.                    *
  *     28 DEC 1993 for U.S. Current Classification data.         *
  *     28 DEC 1993 for U.S. Patent Image Data.                   *
  *                                                               *
  *                                                               *
  *       * PLEASE USE 305-9000 FOR NEW TELEPHONE NUMBER *        *
  *                                                               *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *  DISCLAIMER:                                                  *
  *  Neither the United States Government, nor any agency         *
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  *  employees make any warranty, expressed or implied,           *
  *  including any warranty of marketability of fitness for a     *
  *  particular purpose; nor assumes any legal liability or       *
  *  responsibility for any party's use, or the results of        *
  *  such, of the data.                                           *
  *                                                               *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *    There is a new number to call for APS help: 305-9000.      *
  *    The Help Desk staff at this number will handle all APS     *
  *    related questions. Current hours are 6:30 am to 9:00 pm    *
  *    Monday through Friday and 7:30 am to 5:00 pm Saturday.     *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
15:09:23 COPY AND CLEAR PAGE, PLEASE
28 DEC 93 15:09:24 U.S. Patent & Trademark Office P0002
  *    HOURS TO ACCESS MESSENGER ARE 6:30 AM to 9:00 PM           *
  *    MONDAY THRU FRIDAY AND 7:30 AM to 5:00 PM SATURDAY.        *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
FILE 'USPAT' ENTERED AT 15:09:22 ON 28 DEC 93

  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *              W E L C O M E   T O   T H E                      *
  *         U. S.   P A T E N T   T E X T   F I L E               *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *


=> s digitiser# or digitizer# or pen-based
           80 DIGITISER#
         3173 DIGITIZER#
        14158 PEN
       428589 BASED
           21 PEN-BASED
                (PEN(W)BASED)
L1      3256 DIGITISER# OR DIGITIZER# OR PEN-BASED

=> s trac###(p)(model# or pattern# or stylus or gesture# or style#)
       235123 TRAC###
       125539 MODEL#
       243965 PATTERN#
```

```
          7512 STYLUS
           209 GESTURE#
         25721 STYLE#
L2       18772 TRAC###(P)(MODEL# OR PATTERN# OR STYLUS OR GESTURE# OR STYLE#)

=> s l1 and l2
L3         364 L1 AND L2

=> s handwrit####
L4        1448 HANDWRIT####

=> s l3  and l4
L5          28 L3 AND L4

=> d l5  1-28
```

1. 5,260,697, Nov. 9, 1993, Computer with separate display plane and user interface processor; David M. Barrett, et al., 345/173, 179 [IMAGE AVAILABLE]

2. 5,247,166, Sep. 21, 1993, Form reader with linear CCD scanner and drum feed; Thomas Cannon, et al., 250/208.1; 235/462; 250/569 [IMAGE AVAILABLE]

3. 5,243,149, Sep. 7, 1993, Method and apparatus for improving the paper interface to computing systems; Liam D. Comerford, et al., 178/18 [IMAGE AVAILABLE]

4. 5,233,331, Aug. 3, 1993, Inking buffer for flat-panel display controllers; Liam D. Comerford, et al., 345/3; 178/18; 345/119, 200 [IMAGE AVAILABLE]

5. 5,231,698, Jul. 27, 1993, Script/binary-encoded-character processing method and system; Mitchell D. Forcier, 395/146, 155 [IMAGE AVAILABLE]

6. 5,220,649, Jun. 15, 1993, Script/binary-encoded-character processing method and system with moving space insertion mode; Mitchell D. Forcier, 395/148, 146, 155 [IMAGE AVAILABLE]

7. 5,198,623, Mar. 30, 1993, Method for use in a digitizer for determining pen tilt; Waldo L. Landmeier, 178/19 [IMAGE AVAILABLE]

8. 5,195,133, Mar. 16, 1993, Apparatus and method for producing a digitized transaction record including an encrypted signature; Michael A. Kapp, et al., 380/9; 235/379, 380; 380/22, 23, 43, 49, 55; 382/3 [IMAGE AVAILABLE]

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382/45 [IMAGE AVAILABLE]

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28 DEC 93 15:14:20 U.S. Patent & Trademark Office P0004

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=> d l5 1 kwic

US PAT NO: 5,260,697 [IMAGE AVAILABLE] L5: 1 of 28

ABSTRACT:
A . . . simulated devices, including standard devices such as a keyboard and a mouse. A nonstandard simulated device performs character recognition, permitting handwritten characters to be used for program input. During interaction with one of the user's programs, the user can activate and. . .

SUMMARY:

BSUM(15)

A . . . click. In contrast, while a stylus can be used for character input, very different feedback to the user is required. Handwritten characters are generated by a process that (although familiar to a user) is much more complex, both for the user. . .

SUMMARY:

BSUM(18)

If programs designed to use a mouse cursor are used with a stylus that operates directly on the display screen, the user might expect to be able to directly manipulate the cursor with the stylus, i.e., by placing the stylus over the cursor and dragging it. Typically, this works in a way that users are likely to find frustrating: the. . . or even vary within a single application (e.g., it may be a function of velocity); as a result, although the stylus may start on the object, the object will not track the position of the stylus.

SUMMARY:
28 DEC 93 15:15:55 U.S. Patent & Trademark Office P0005

US PAT NO: 5,260,697 [IMAGE AVAILABLE] L5: 1 of 28

BSUM(21)

The input of character codes presents another type of impediment to running preexisting (non-stylus) programs with a stylus. Input of handwritten characters is a sufficiently complex as to require feedback to the user. Yet a program not contemplating handwritten input wig have defined a user interface with no provision for such feedback.

DRAWING DESC:

DRWD(12)

FIG. 10 is a screen display showing three simulated device icons: keyboard, handwriting, and mouse.

DETDESC:

DETD(32)

runs a handwriting recognition algorithm (a part of the simulated devices interface).

DETDESC:

DETD(65)

An article titled "Digitizer Technology: Performance Characteristics and the Effects on the User Interface" (IEEE Computer Graphics and Applications, April 1987, pp 31-44) describes digitizer technology.

DETDESC:

DETD(75)

A 3-point calibration is done for each unit as part of the manufacturing process (to correct for misalignment of the digitizer and the display) and stored in stable memory (e.g., disk, battery-backed CMOS RAM, EEROM). The calibration parameters are used by. . .

DETDESC:

DETD(168)

A set of simulated devices is available to the user: keyboard, mouse, handwriting input device.

DETDESC:

DETD(169)

Some . . . look to the user unlike any of the devices with which the application is designed to operate. For example, the handwriting input device is less closely related to a standard device. In a sense, the handwriting input device simulates (to the user) handwriting input previously only available with applications developed specifically for use with handwritten input. From the application's perspective, this device simulates a keyboard; although keys need not be involved (real or simulated), the handwriting input device provides keycode data to the application.

=> d l5 2 kwic

US PAT NO: 5,247,166 [IMAGE AVAILABLE] L5: 2 of 28

ABSTRACT:
A form reader especially for lottery forms with handwritten marks or bar codes includes a drum transport engaging the form, and a stepping motor advances the form circularly along. . . X-Y array of pixels. A digital processor coupled to an image memory analyzes the data for predetermined patterns such as handwritten marks, printed reference marks and/or printed bar code or OCR characters on the form. A throat sensor detects the form. .
.

SUMMARY:

BSUM(5)

Forms for recording handwritten marks for entry of data into a data processing system generally have a plurality of discrete areas arranged in a. . .

SUMMARY:

BSUM(6)

Upon . . . lottery central computer over the data communication link. This data can be read automatically in the same manner as a handwritten entry form, using an appropriate scanner.

SUMMARY:

BSUM(7)

Hand-marked . . . and column form a photocell can be oriented to read each of a number of rows of delineated areas or tracks. The level of reflected light along a track on the form is related in time or position to the pattern which was printed on the form to define the columns, such that a two dimensional array of marks (or missing. . .

SUMMARY:

BSUM(8)

Certain . . . which may vary in the form and in the reading process. A form can be misaligned to the feeder; the handwritten or printed marks can vary in character and darkness; the illumination source can vary with aging; the printed delineations can. . .

SUMMARY:

BSUM(16)

It . . . of a form reader including an image processor to allow use with forms of various formats and sizes, and with handwritten as well as printed

28 DEC 93 15:17:03 U.S. Patent & Trademark Office P0008

US PAT NO: 5,247,166 [IMAGE AVAILABLE] L5: 2 of 28

BSUM(16)
forms.

SUMMARY:

BSUM(18)

These and other aspects of the invention are found in a form reader especially for lottery forms with handwritten or printed marks. The form reader includes a drum transport engaging the form, and a stepping motor for advancing the. . . A digital processor coupled to an image memory accesses the pixel data and analyzes the data for predetermined patterns, namely handwritten marks, printed reference marks, bar code, etc. A throat sensor detects the form at an inlet to the reader for. . .

DETDESC:

DETD(7)

Top . . . is to be ignored, for example red light to ignore green printing, etc. Preferably the reader is arranged to detect handwritten marks in pencil or pen, as well as black, blue or purple printing on the form. The light from the. . .

DETDESC:

DETD(17)

The . . . of options, and are encoded digitally by the microprocessor. The output of the microprocessor, for example numerical data represented by handwritten marks at corresponding numbered locations, or numerical or alphabetical codes represented by printed barcode, OCR characters or the like, can. . .

DETDESC:

DETD(19)

The . . . reading of lottery tickets and the like, but is also applicable to marked forms generally, including forms wherein selections are handwritten, or where a serial number or other indicia is printed on the form by machine.

DETDESC:

DETD(20

=> d 15 3 kwic

US PAT NO: 5,243,149 [IMAGE AVAILABLE] L5: 3 of 28

SUMMARY:

BSUM(3)

The . . . input device for capturing, preserving and correlating information in a variety of formats, including at least image (text and/or graphics), handwritten information and audio information.

SUMMARY:

BSUM(5)

Notwithstanding . . . screen. It is common for work (such as revisions, additions, document creation and annotations) which is performed on paper using handwriting to be transcribed into computer files by laborious effort at work stations. Similar laborious effort is required when documents are. . .

SUMMARY:

BSUM(6)

The prior art evidences a variety of information input interfaces including facsimile or scanning input devices, digitizing tablets to capture handwritten information, audio input devices to capture audible information, and keyboards to input coded information. The variety of these devices do. . . a single form of information. While facsimile or scanner devices can capture both printed or typed text as well as handwriting, the file that is produced as a result of such input is limited substantially to preserving and reproducing the input. . . for extracting information from images of typed text, such as OCR methods as well as methods of extracting information from handwritten information (handwriting recognition systems) neither is effective on an image which includes both printed text as well as handwritten information.

SUMMARY:

BSUM(9)

As . . . paper as an off-line medium for computer interaction includes both hardware and software components. The hardware components include a stylus digitizer (sometimes referred to as a tablet) and a scanner. These input elements are combined with an embedded processor in order to format the output from the scanner and digitizer into data files on a non-volatile medium or the dump those files to other systems through a convenient conventional port.. . . or events can be correctly combined. The subsequent event or events can be either or both of audio annotation and/or handwritten annotation. The display allows a path to conduct page number and status information to be provided to the user. Local. . .
28 DEC 93 15:17:45 U.S. Patent & Trademark Office P0010

US PAT NO: 5,243,149 [IMAGE AVAILABLE] L5: 3 of 28

BSUM(9)

SUMMARY:

BSUM(10)

In . . . clipboard is detachable and is formed for use as a hand-held scanner. The board portion of the clipboard contains a stylus digitizer. The hand-held scanner is arranged to mechanically interface with the stylus digitizer via spring-loaded toggles which engage tracks on the digitizer either on the bottom or at the edges of the board. With this mechanical interface, when a piece of paper is supported by the digitizer, the scanner can be run across the page guided by the tracks so that an image of the page is captured by the scanner. As the scanner reaches one end of the digitizer, it is locked into a final position at the top of the board where it locks the paper to the digitizer. The paper is now said to be "mounted" in the same sense as a disk or tape file may be. . . board is then available for future upload to a more complete information processing system. Similarly, any annotations made with the digitizer are saved in the clipboard memory and associated with the scan image. Preferably, the digital information which is captured by the clipboard (either the scanner or the digitizer) can be compressed to conserve storage.

SUMMARY:

BSUM(11)

It . . . reduction to coded form through a combination of recognition software techniques, e.g. optical character recognition for printed or typed text, handwriting recognition for written annotations and speech recognition for speech annotation.

SUMMARY:

BSUM(14)

Note-taking . . . where the attendees do not have an available computing system. Work begins on the document by mounting it on the digitizer.

SUMMARY:

BSUM(15)

As . . . to prepare a file header for the data reflecting that page. As the user makes annotations or adds text in handwriting, the digitizer generates data describing the stylus motion; that data is gathered and stored with a link to the scanned image. The stylus operations can include handwriting, gestures and graphics. The data added as a consequence of operation of the digitizer is of the kind needed by handwriting recognition algorithms. Preferably, the tool is also equipped with speech annotation apparatus allowing the user to point to or scribe. . .

DETDESC:

DETD(9)

FIG. . . . 201, RAM 202, ROM 203, disk drive 209, I/O port 212, display

US PAT NO: 5,243,149 [IMAGE AVAILABLE] L5: 3 of 28

DETD(9)
250, analog to digital converter 254, a stylus digitizer 210, scanner interface 206 and scanner element 15S. FIG. 10 also illustrates that these components are powered by an internal. . .

DETDESC:

DETD(13)

In typical use, a document is first scanned and thereafter annotated either with a digitizer or with audio information. Consequently, unless otherwise commanded by the user, annotation files (created by the digitizer or the use of the microphone) will be linked to the most recently scanned document file. When a document is. . . indicate to the system that a document other than the most recently scanned document is to be annotated. When a digitizer or audio annotation file is created, entries are made to the appropriate control file in order to provide a link. . . annotation file or files. It should be apparent that other conventional techniques of linking information from an optical scanner, the digitizer tablet and audio input information can also be employed in lieu of the linking arrangement just described. For example, rather. . .

DETDESC:

DETD(17)

When signals are detected from the digitizer, function D1 is performed to capture the stylus motion in a manner which is conventional. At an appropriate point, function. . .

DETDESC:

DETD(19)

FIG. . . . course, as has been explained, the control file associated with document 110 had at least one entry identifying the associated digitizer file. The control file 110 may, but need not, have an explicit entry identifying the scanned file inasmuch as the. . .

DETDESC:

DETD(21)

Returning . . . to the user, who has now mounted the document D on the electronic clipboard, now assume that he adds several handwritten annotations on the document such as the annotations N1-N3 shown in FIG. 13B. The act of creating these annotations, inasmuch as the document D is supported on the digitizing tablet, will create tablet signals from the digitizer 210. The signals will be employed by the CPU 201 to create a file DIGITIZE 113 to be stored on. . .

DETDESC:

DETD(22)

Having . . . from the files SCAN 113 and DIGITIZE 113 by using respectively character recognition analysis on the file SCAN 113 and

US PAT NO: 5,243,149 [IMAGE AVAILABLE] L5: 3 of 28

DETD(22)

handwriting recognition software on the file DIGITIZE 113. To the extent that the user's annotations N1-N3 can be analyzed using handwriting recognition, those annotations can be translated into encoded form, just as character recognition can translate the image such as that. . .

DETDESC:

DETD(23)

Application . . . it is secured to the digitizing tablet of the invention. More particularly, the user has annotated the document by the handwritten insertions numbered 1-3. As a consequence of the fact that the handwritten annotations were created while the document was supported on the digitizing tablet, the electronic clipboard of the invention has captured. . .

DETDESC:

DETD(24)

Having . . . the files SCAN 114 and DIGITIZE 114 to a workstation apply character recognition analysis to the file SCAN 114 and handwriting recognition to the file DIGITIZE 114.

DETDESC:

DETD(26)

FIG. . . . file and the digitized file. It should also be apparent that if desired the workstation 400 can display only the handwritten annotation. Furthermore, the workstation 400 can apply conventional optical character recognition techniques to the scanned file so as to derive. . . version of the information recently contained in the document D. In a similar fashion, the workstation 400 can apply conventional handwriting recognition to the digitized file to obtain a coded version of the handwritten annotations. It is also possible for the workstation 400 to apply voice recognition techniques to an audio annotation file to. . .

CLAIMS:

CLMS(31)

31. . . . the tablet data is stored in a separate tablet file which has a format suitable for efficient operation of a handwriting recognition process.

CLAIMS:

CLMS(35)

35. A method as recited in claim 34 which comprises the further step of executing a handwriting recognition process on said tablet file to extract information therefrom.

=> d l5 5 kwic
28 DEC 93 15:19:37 U.S. Patent & Trademark Office P0013

US PAT NO: 5,231,698 [IMAGE AVAILABLE] L5: 5 of 28

ABSTRACT:
A pen-based processor needs to be usable to input and edit script in the manner of a text-based computer but retain a resemblance to the user much like a pad and pencil. The pen-based computer implements enable input, editing and other manipulation of handwritten script, ASCII text and drawings in a common document using a compatible internal representation of the data and a simple,. . .

SUMMARY:

BSUM(2)

This invention relates generally to pen-based computer systems and more particularly to an interactive method for entry and editing of script, text and drawings in a. . .

SUMMARY:

BSUM(3)

Script refers to handwritten characters and words. Text refers to typewritten characters and words and includes binary-encoded characters such as ASCII text. Drawings refers. . .

SUMMARY:

BSUM(4)

Existing pen-based systems use gestures to edit exclusively script or ASCII text (i.e., not both interchangeably or simultaneously). They are limited, moreover,. . .

SUMMARY:

BSUM(5)

Editing . . . or words, erasing characters or words, and applying enhancements to pieces of script (e.g., underline, bold, etc.). No known prior pen-based system enables script words to be word-wrapped, let alone doing it with mixed script and ASCII text. Developers have probably. . .

SUMMARY:

BSUM(8)
A word wrapping algorithm for handwritten script is unheard of, to say nothing of one that can maintain the user's spacing of strokes (words).

SUMMARY:

BSUM(12)

Script is composed of strokes; pen movements captured as the stylus traces a character outline on a digitizing tablet. A script character can contain one or more strokes. Each stroke must be. . .

SUMMARY:
28 DEC 93 15:19:38 U.S. Patent & Trademark Office P0014

US PAT NO: 5,231,698 [IMAGE AVAILABLE] L5: 5 of 28

BSUM(13)

Another drawback to current art for capturing pen-based stroke data input is the inability of current systems to wrap words and maintain predesignated spacing between words that have. . .

SUMMARY:

BSUM(14)

A . . . a method for identifying word separation space. This, however, requires complex software and hardware capability beyond that of the typical

pen-based technology commercially available. Accordingly, a method is required which reliably captures word spacing without complex computer analysis of stroke data.

SUMMARY:

BSUM(15)

Accordingly, a need remains for a better way to enter, store, manage and edit handwritten script, or preferably script and binary-encoded text, in a pen-based computer system.

SUMMARY:

BSUM(17)

One object of the invention is to provide an improved pen-based computer system and script editing process.

SUMMARY:

BSUM(20)

Another object is to provide an intuitive interactive user interface for a pen-based computer.

SUMMARY:

BSUM(25)

Input to the script/text processor can take many forms: writing with a pen (stylus) on a digitizer connected to a computer; existing or stored documents; documents from character (keyboard) based word processors; FAX transmissions and scanned documents.. . .

SUMMARY:

BSUM(29)

Another . . . document. This aspect enables the processor to provide editing/word processing features that prior to this invention were not available for handwritten documents. It can also facilitate outlining. Additionally, because the script/text processor of the invention can manipulate words as images, script. . .

28 DEC 93 15:20:02 U.S. Patent & Trademark Office P0015

US PAT NO: 5,231,698 [IMAGE AVAILABLE] L5: 5 of 28

BSUM(29)

SUMMARY:

BSUM(32)

Other pen-based systems are known to use a set of stylus gestures for editing functions. Rather than limiting gestures to editing only. . .

DRAWING DESC:

DRWD(3)

FIG. 1 is a block diagram of a PC with a pen-based script/text entry and editing system according to the invention.

DRAWING DESC:

DRWD(4)

FIG. 2 is a block diagram of a free-standing pen-based computer system incorporating the present invention.

DRAWING DESC:

DRWD(12)

FIG. 10 is a diagram showing a method of text entry in a pen-based computer system.

DETDESC:

DETD(2)

The following description outlines various hardware and software environments in which the handwritten script and text (e.g., ASCII) processing software of the invention can be implemented. Next described in subsequent sections are script/text. . . of ASCII text in internal stroke format, concluding with an example showing a series of editing processes in an operational pen-based system according to the invention.

DETDESC:

DETD(4)

FIG. 1 shows a personal computer (PC) 10 having a graphics input device such as a digitizer 12 that is sensitive to a pen or stylus 14 that can be used to enter script and editing gestures. . . a document containing script and/or ASCII text. This computer has a document display screen 16 distinct from its pen sensitive digitizer and can include a printer 18 or other output device. FIGS. 7 and 7A-7O show document pages from such a. . .

DETDESC:

DETD(5)

US PAT NO: 5,231,698 [IMAGE AVAILABLE] L5: 5 of 28

DETD(5)

The . . . to create and edit documents using a keyboard (not shown) for text entry. The presently preferred input device is a digitizer which is responsive both to stylus contact (pen down), position and stylus proximity (pen close--e.g., 1/2" or 1 cm.) such as the WACOM 50-510C digitizer and stylus, U.S. Pat. No. 4,786,765. Alternatively, a digitizer and stylus that

is contact, position and pressure sensitive could be used, such as made by Summagraphics Corp., U.S. Pat.. . .

DETDESC:

DETD(6)

FIG. 2 shows a notebook sized computer 20 with integrated display and digitizer 2 that is responsive to a pen (stylus) 24, and an output device shown in this instance as a FAX/Modem. . .

DETDESC:

DETD(8)

A FAX machine with integrated display and digitizer that is connected to a computer and responsive to a pen (stylus);

DETDESC:

DETD(9)

A Whiteboard/Blackboard type of display having an integrated digitizer that is responsive to a pen (stylus) and connected to a computer; or

DETDESC:

DETD(10)

A pen sensitive digitizer and light transmissive display panel (e.g., LCD) connected to a computer and positioned as an overlay on an overhead projector.. . .

DETDESC:

DETD(14)

It . . . control the hardware components attached to a computer system via software commands. This can include sensing stylus position on a digitizer, capturing keystrokes on a keyboard, or outputting graphic images onto a display.

DETDESC:

DETD(27)

FIG. 3 shows the main process of the present invention. The various pen or stylus digitizer events that drive the application are described as follows:

=> d 15 7 kwic

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L5: 7 of 28
TITLE: Method for use in a digitizer for determining pen tilt

ABSTRACT:
A digitizer includes a tablet having an array of conductors, and a

pen-shaped, coil-containing stylus. The digitizer applies an energizing signal to either the conductors or the stylus, which signal induces voltages in the other. Then, the digitizer detects the induced voltages corresponding to the conductors, which define a voltage waveform having a positive peak, a negative peak, and a zero-crossing therebetween. The digitizer corrects for pen tilt in determining stylus position on the tablet by determining a position value for the zero-crossing using. . .

SUMMARY:

BSUM(2)

This invention relates generally to digitizers used to enter and record position information in computers, and more particularly to a method for determining "pen tilt in digitizers." The invention also pertains to a method for compensating for "pen tilt" in determining the position of a stylus on a digitizer tablet.

SUMMARY:

BSUM(4)

A known type of digitizer employs a tablet having a planar upper surface for supporting work sheets, e.g., drawings, charts, maps or the like. The. . .

SUMMARY:

BSUM(6)

The digitizer also employs a pen-shaped pointer, commonly called a stylus. The stylus typically has an elongated, cylindrical body terminating in a. . .

SUMMARY:

BSUM(7)

In generating a signal indicative of the position of the stylus, the digitizer applies an electrical signal, e.g., to the electrical coil, to induce signals in the grid conductors due to electromagnetic inductance. . . pulses of various amplitudes corresponding to the location of the conductors with respect to the stylus coil. (Alternatively, in other digitizer designs, the electrical signals are applied to the grid conductors while the signals electromagnetically induced in the electrical coil are. . .

28 DEC 93 15:21:48 U.S. Patent & Trademark Office P0019

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L5: 7 of 28

BSUM(7)

SUMMARY:

BSUM(9)

During use of the digitizer, an operator uses the stylus to trace,

points or lines on the tablet work sheet. The digitizer regularly generates and stores data representing the positions of the stylus as it moves.

SUMMARY:

BSUM(11)

Unfortunately, . . . the tablet while, due to the tilt, the "apparent" position of the stylus tip, as would be detected by the digitizer absent correction for pen tilt, is at another point on the tablet. The point on the tablet at which the. . .

SUMMARY:

BSUM(12)

The . . . grid plane. The distance between the contact point and the apparent stylus position can be called "projection error." Unless the digitizer compensates in the position reading to account for projection error along each axis of measurement, such error could reduce significantly the digitizer's accuracy.

SUMMARY:

BSUM(13)

The problem of pen tilt in digitizers is not new, and methods for correcting it are known in the art. For instance, U.S. Pat. No. 3,873,770 issued. . . of providing digital position measurements with stylus tilt error compensation. As described in that patent, the voltage waveform from the digitizer typically has a pair of spaced characteristic peaks whose magnitudes correspond to pen tilt. The patent's technique provides an error. . .

SUMMARY:

BSUM(14)

Commonly-assigned U.S. Pat. No. 4,939,318 (Watson) discloses another method of detecting and correcting for pen tilt in a digitizer. The approach disclosed in the Watson patent determines pen tilt correction by comparing the magnitudes of an induced signal waveform. . .

SUMMARY:

BSUM(15)

The technique taught in the Watson patent is generally satisfactory in compensating for pen tilt, particularly in digitizers having tablets

28 DEC 93 15:21:52 U.S. Patent & Trademark Office P0020

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L5: 7 of 28

BSUM(15)
employing inter-conductor spacings (i.e., the distance between the conductors in the x-direction or y-direction) up to a maximum. . .

SUMMARY:

BSUM(16)

The Watson approach encounters problems, however, in digitizer tablets having larger inter-conductor spacings. It has been determined empirically that, with a coil diameter of a fraction of an. . .

SUMMARY:

BSUM(18)

Briefly, the invention resides in a method of determining pen-tilt-compensated positions of a stylus on a digitizer tablet, which uses voltage waveform points occurring between as well as outside the peak voltages While the invention permits the. . .

SUMMARY:

BSUM(20)

More specifically, the digitizer applies an energizing signal to either the conductors or the stylus, which signal induces a voltage in the other. Then, the digitizer detects the induced voltages corresponding to the conductors, which define a voltage waveform having a positive peak, a negative peak,. . .

SUMMARY:

BSUM(21)

The digitizer corrects for pen tilt in stylus position determinations by first computing a position value for the zero-crossing by applying preferably. . . linear interpolation techniques to conductor voltages in a region between the positive and negative peaks of the waveform. Preferably, the digitizer uses for these purposes the voltages corresponding to the conductors next adjacent the zero-crossing on both sides (i.e., conductors a.sub.0. . .

SUMMARY:

BSUM(22)

Then, the digitizer generates a pen-tilt-indicating value using the just-calculated zero-crossing position value and preferably linear interpolation techniques applied to conductor voltages in. . .

SUMMARY:

BSUM(24)

Alternatively, . . . be used in many applications in and of itself. For instance, this value can be used in security systems employing handwriting

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L5: 7 of 28

BSUM(24)
recognition to identify personnel, e.g., by the characteristic angle at which individuals hold writing instruments. It can also be used. . .

DRAWING DESC:

DRWD(3)

FIG. 1 is a representation, partially in block diagram form, of a digitizer in accordance with the invention;

DRAWING DESC:

DRWD(4)

FIG. 2 is an enlarged, sectional view of a portion of the digitizer tablet and stylus of FIG. 1, which illustrates the problem of pen tilt;

DRAWING DESC:

DRWD(5)

FIG. 3A-3C are graphs showing typical voltage waveforms generated by the digitizer of FIG. 1, with voltage plotted against time or distance along the tablet upper surface; and

DETDESC:

DETD(2)

In FIG. 1, a digitizer 10 has a tablet 12 including a conductor grid or array 13 composed of a set of parallel, equi-spaced conductors. . .

DETDESC:

DETD(3)

The digitizer 10 also has a conventional, movable pen-shaped stylus 20 with an electrical coil 22 disposed a short distance above its. . .

DETDESC:

DETD(4)

In addition, the digitizer 10 has a control circuit 26. The control circuit 26 includes a conventional alternating current (AC) supply 28, conventional detection. . .

DETDESC:

DETD(5)

FIG. . . . by the conductor grid 13 at a point which is offset from the contact point by a distance "PE." The digitizer 10 will normally determine that, under these conditions (and absent correction for pen tilt), the apparent position of the stylus. . .

=> d l5 8 kwic

US PAT NO: 5,195,133 [IMAGE AVAILABLE] L5: 8 of 28

DRAWING DESC:

DRWD(10)

FIG. 8 is a flow diagram of the process employed to transform the coordinates of a position of a transparent digitizer to the corresponding coordinates of a display module.

DETDESC:

DETD(4)

As . . . mate along the edges thereof. The upper housing 42 has an aperture 44 within which is placed a transparent interactive digitizer element 46 which is capable of generating electrical signals which represent the position of the stylus 26 or other device placed in contact therewith. Broadly speaking, during operation of the interactive element 46, the stylus 26 acts as a probe and the differing potentials between sides of the element, in two coordinate directions, are measured. converted into digital form, and are processed through correction algorithms. This enables a trace of the movement of the stylus to be captured and retained, as well as displayed on a liquid crystal display (LCD) module 48. Interactive elements of this type are commercially available, and one such device which can be employed in the present invention is a controller/digitizer/pen marketed by MicroTouch Systems Inc., Wilmington, Mass. under the trademark ScreenWriter.

DETDESC:

DETD(5)

Positioned . . . representation of a signature on the transaction image. Thus, since the LCD module 48 is positioned directly beneath the transparent digitizer element 46, the movements of the stylus 26 on the transparent surface 24 are graphically captured and are immediately visible. . .

DETDESC:

DETD(7)

The . . . apparatus 20, as viewed in FIG. 2. A control circuit board 56 which functions as a controller for the transparent digitizer element 46 is located below the LCD module 48 in the lower housing 40 of the apparatus 20 and includes a connector 57 for connection to the digitizer element 46 and also includes a microcontroller 64. Circuit board 56 may include circuitry for automatically adjusting the contrast control. . .

DETDESC:

DETD(15)

US PAT NO: 5,195,133 [IMAGE AVAILABLE] L5: 8 of 28

DETD(15)
ACCEPT messages activate logic that causes microcontroller 64 to sense the activation of stylus 26 and begin accepting X,Y coordinate from digitizer 56. This information is captured and "echoed" to the LCD 48 to provide a signature display to the signer in. . .

DETDESC:

DETD(22)

The . . . signature of the type produced by ordinary bit-mapping. Capturing of the signature begins upon contact of the stylus 26 with digitizer screen 46, at which time a pair of starting coordinates, Start.sub.-- X and Start.sub.-- Y are generated. These coordinates are. . .

DETDESC:

DETD(39)
. . .
Download Record to Processor

		Memory
Update	DC	Download Character Set
Update	D8	Echo Data to LCD from MSR, Digitizer or MICR Card

DETDESC:

DETD(40)

In order to display stylus generated information on the LCD module 48, it is necessary to transform the digitizer coordinates into the coordinate system of the LCD module. This process is performed by the PC controller 64. The process. . .

DETDESC:

DETD(41)

The . . . then proceeds to block 212 in which an inquiry is made as to whether the stylus 5 is touching the digitizer 2. The process does not continue until the stylus does touch the digitizer. When the stylus is touching the digitizer, the process continues to block 214, in which the transparent digitizer coordinates "touch.sub.-- X" and "touch.sub.-- Y" are determined and transmitted by the transparent digitizer controller included in block 56 to the PC controller 64. These coordinates represent the instantaneous position of the stylus 26. . .

DETDESC:

DETD(47)
touch.sub.-- X, touch.sub.-- Y are digitizer coordinates,

DETDESC:

DETD(52)

=> d 15 9 kwic

US PAT NO: 5,155,813 [IMAGE AVAILABLE] L5: 9 of 28

SUMMARY:

BSUM(7)

Inputting . . . pen or other non-force-sensitive writing implement lack proper visual feedback. C.G. Leedham and A.C. Downton in "On-line Recognition of Pittman's Handwritten Shorthand - an Evolution of Potential", International Journal of Man-Machine Studies, Volume 24, Pages 375-393 (1986) showed that the lack. . .

DETDESC:

DETD(29)

The . . . data points at the fastest data rate possible. Because most calligraphy is performed at a somewhat slower pace than normal handwriting, and because of the importance placed on stroke quality, two hundred samples per second (with a 5 millisecond fill time). . . of temporal resolution (200 points per second) gives very realistic calligraphy stroke feedback and is within the acceptable level for handwriting at normal speeds as described by M.J. Phillips in "Several Simple Steps Can Help You Choose the Correct Digitizer", Computer Technology Review. Volume 7, No. 1, Jan. 1987.

DETDESC:

DETD(37)

From . . . brushed strokes (i.e. images thereof) to be created on the display unit 18 in response to user operation of the stylus 14 on the tablet 16 in a brush imitating manner. To prevent stray marks or line segments from appearing on. . . detected zero force values. Thus very slow transition from pen down to pen up or vice versa do not leave traces during the zero force episode.

=> d 15 10 kwic

US PAT NO: 5,150,420 [IMAGE AVAILABLE] L5: 10 of 28

DRAWING DESC:

DRWD(4)

FIG. 2 is an external view showing a handwriting input device of a writing unit employed in the signature identification system;

DETDESC:

DETD(4)

In FIG. 2 there is shown a handwriting input device of a writing unit employed in the signature identification system of this embodiment. The reference numeral 21 represents a so called digitizer which converts an
28 DEC 93 15:25:03 U.S. Patent & Trademark Office P0027

US PAT NO: 5,150,420 [IMAGE AVAILABLE] L5: 10 of 28

DETD(4)
image signal into digital data and includes an operation panel 21a to read the hand-written signature signed thereon by a stylus pen 22. The handwriting input device is connected with a small computer (not shown in any drawings) so as to store the read handwritten signature into a memory of the small computer as a bit pattern. The area for reading such image data as the handwritten signature is restricted within a frame 21b in the center of the operation panel 21a so that the operator can. . .

DETDESC:

DETD(5)

FIG. 4 shows a block diagram of a control section of the writing unit employing the handwriting input device 21 shown in FIG. 2. Exemplarily, the hand-writing input device 21 is designed to have a digitizer employing an electromagnetic induction method to produce matrix data or coordinate data through an RS232C type interface which are generated by the trace of the stylus pen. A CPU 20 employing a microprossor is disposed to control all operations for the writing unit. An operation program. . .

DETDESC:

DETD(6)

FIG. . . . illustrating the operations by the CPU 20. In step n10, the CPU 20 reads out the data developed from the handwriting input device 21, and inquires if the read out data include a pen down signal, i.e., if the stylus pen. . .

DETDESC:

DETD(7)

If the writing switch 21c of FIG. 2 is actuated after entering a handwriting signature by the stylus pen in step n18, the card data stored in RAM 23 are read out to be. . .

DETDESC:

DETD(13)

Although . . . stored in the memory of the IC card as a bit image as they are, an input pattern of the handwriting signature may be stored and displayed as the combination of strokes having start and end points in a compressible manner.. . .

CLAIMS:

CLMS(1)

What . . .

hand-written signature data representing a genuine signature of said user in a data storage area therein, said system comprising:
a handwriting input device comprising:
signature input means for inputting a hand-written signature;

=>
=> d l5 11 kwic

US PAT NO: 5,148,155 [IMAGE AVAILABLE] L5: 11 of 28

ABSTRACT:
A . . . simulated devices, including standard devices such as a keyboard and a mouse. A nonstandard simulated device performs character recognition, permitting handwritten characters to be used for program input. During interaction with one of the user's programs, the user can activate and. . .

SUMMARY:

BSUM(15)

A . . . click. In contrast, while a stylus can be used for character input, very different feedback to the user is required. Handwritten characters are generated by a process that (although familiar to a user) is much more complex, both for the user. . .

SUMMARY:

BSUM(18)

If programs designed to use a mouse cursor are used with a stylus that operates directly on the display screen, the user might expect to be able to directly manipulate the cursor with the stylus, i.e., by placing the stylus over the cursor and dragging it. Typically, this works in a way that users are likely to find frustrating: the. . . or even vary within a single application (e.g., it may be a function of velocity); as a result, although the stylus may start on the object, the object will not track the position of the stylus.

SUMMARY:

BSUM(21)

The input of character codes presents another type of impediment to running pre-existing (non-stylus) programs with a stylus. Input of handwritten characters is a sufficiently complex as to require feedback to the user. Yet a program not contemplating handwritten input will have defined a user interface with no provision for such feedback.

DRAWING DESC:

DRWD(10)

FIG. 10 is a screen display showing three simulated device icons: keyboard,

handwriting, and mouse.

DETDESC:

=> d l5 12 kwic

US PAT NO: 5,115,107 [IMAGE AVAILABLE] L5: 12 of 28
TITLE: Method of correcting skew between a digitizer and a digital display

ABSTRACT:
A . . . drive signal which is free of skew. Disclosure is made of a point of sale merchandising system having a transparent digitizer mounted on an LCD module. A stylus is used to draw a signature on the digitizer, and the signature is displayed on the LCD module in registration with the moving stylus. Skew effects are eliminated by. . .

SUMMARY:

BSUM(2)

This . . . providing paper receipts to customers as needed. It relates more particularly to a point of sale system using a transparent digitizer positioned over a display and still more particularly to a method of eliminating the effects of skew between the digitizer and the display.

SUMMARY:

BSUM(4)

It . . . application Ser. No. 575,096, filed Aug. 30, 1990, the disclosure of which is incorporated herein by reference, utilizes a transparent digitizer equipped with a stylus. When a user moves the stylus across the front surface of the digitizer, the position of the stylus is sensed and digitized. The digitizer is mounted against the surface of a liquid crystal display which is activated to display information relating to a transaction then in progress. Information which is so displayed can be seen through the digitizer and therefore is visible to the user.

SUMMARY:

BSUM(5)

In . . . desired that the displayed mark be in exact registration with the stylus, so that the user can make a normal handwritten signature and see it displayed as the writing progresses However, this requires that the digitizer and the display be in precise alignment. Any misalignment between the digitizer and the display device causes the progressing signature display to be out of registration with the movement of the stylus,. . .

SUMMARY:

BSUM(6)

Misalignment . . . three components: offset, scale and skew. Offset is caused by a misalignment of absolute origins between the display and the

digitizer coordinate systems. Scale misalignment is caused by an unequal distance per coordinate count between the two coordinate systems. Skew is. . .

28 DEC 93 15:26:28 U.S. Patent & Trademark Office P0031

US PAT NO: 5,115,107 [IMAGE AVAILABLE] L5: 12 of 28

BSUM(6)

SUMMARY:

BSUM(7)

Skew may be caused by inaccurate mounting of the digitizer on the display. It may also result from uneven heating of the digitizer surface during use. Digitizers which employ a resistive coating on the active surface are particularly susceptible to heat-induced skew. Other causes of skew may be low quality electronic components or a non uniformly deposited resistive coating on the digitizer. This invention addresses such problems.

SUMMARY:

BSUM(9)

The present invention provides a method of eliminating the effect of skew between a digitizer and a display device so as to enable production of a completed payment document having a captured customer signature in. . .

SUMMARY:

BSUM(10)

In accordance with the practice of this invention a digitizer having a transparent touch panel is placed over a display module which preferably comprises a liquid crystal display. A moveable stylus is connected to the digitizer and is moved across the active surface of the digitizer to generate position signals touch.sub.-- x and touch.sub.-- y representing the position of the stylus tip in a reference frame fixed to the digitizer.

DRAWING DESC:

DRWD(8)

FIG. 7 is a schematic illustration of coordinate systems attached to a digitizer and a display surface which are offset and skewed with respect to each other.

DETDESC:

DETD(4)

As . . . 44 in a frame 24 within which transparent panel 46 is placed. The panel 46 forms part of an interactive digitizer 47 (FIG. 5) which is capable of generating electrical signals representing the position of the stylus 26 relative to panel 46. Broadly speaking, during operation of the digitizer 47, the stylus 26 acts as a probe, and the differing potentials between sides of the digitizer, in two coordinate directions, are measured,

converted into digital form, and are processed through correction algorithms to obtain digital position. . . and touch.sub.-- y. Techniques for generating position signals such as touch.sub.-- x and touch.sub.-- y are well known in the digitizer art and further description thereof is unnecessary herein. These position signals are used for generating image drive signals lcd.sub.-- x and lcd.sub.-- y, as hereinafter described. This enables a trace of the movement of the stylus to be captured and

28 DEC 93 15:26:51 U.S. Patent & Trademark Office P0032

US PAT NO: 5,115,107 [IMAGE AVAILABLE] L5: 12 of 28

DETD(4)
retained, as well as displayed on a liquid crystal display (LCD) module 48. Suitable interactive digitizers for this purpose are readily available from a number of sources. One such device is the ScreenWriter controller/digitizer/pen marketed by MicroTouch Systems Inc., Wilmington, Massachusetts. The operating details for another suitable digitizer are disclosed in Kable U.S. Pat. No. 4,678,869.

DETDESC:

DETD(5)

Liquid crystal display module 48 is positioned directly beneath the interactive transparent digitizer 46 and is visible therethrough. Liquid crystal display (LCD) module 48 is capable of displaying images in response to drive. . .

DETDESC:

DETD(6)

It will be appreciated that digitizer 47 generates output signals which change at a relatively high clock frequency to more or less continuously represent the position. . .

DETDESC:

DETD(8)

The . . . the apparatus 20, as viewed in FIG. 2. A control circuit board 56 which functions as a controller for the digitizer 47 is located below the LCD module 48 in the lower housing 40 of the apparatus 20 and includes a connector 57 for connection to the digitizer element 46 and also includes an RS232 connector 59 to a PC controller 64. A contrast control 58 for changing. . .

DETDESC:

DETD(9)

FIG. . . . input apparatus 20 is shown in block form in phantom lines, and includes the LCD module 48 and the interactive digitizer element and controller 47, with associated stylus 26. The magnetic stripe reader 32 is shown in a separate phantom line. . .

DETDESC:

DETD(10)

The . . . controller 64, and in effect takes the place of the CRT display which would normally be associated with the PC. Digitizer 47 is connected to the PC controller 64 by an RS232 data bus 72 which carries the position signals touch.sub.-- x and touch.sub.-- y from the digitizer to the PC. The above noted microprocessor carries out appropriate transformation to convert touch.sub.-- x and touch.sub.-- y to the. . .

=> d 15 13 kwic

US PAT NO: 5,051,736 [IMAGE AVAILABLE] L5: 13 of 28

SUMMARY:

BSUM(4)

X-Y graphical input devices are relatively well-known in the computer arts for inputting graphical data such as handwritten text, symbols, drawings, etc., where it is desired to convert the instantaneous position of the stylus on a tablet into. . .

SUMMARY:

BSUM(9)

There . . . low sampling rate and considerable inaccuracy or drift in the values produced and generally are unsuitable for such applications as handwritten text input and the like.

SUMMARY:

BSUM(20)

An . . . function") and does not anticipate the use of the pen for raw data input applications such as the above described handwritten text, etc. Also the contact switch 11 indicates that this is a point and read device rather than a continuous. . .

SUMMARY:

BSUM(29)

The . . . square inch which provides extremely high resolution thus making the system suitable for high quality graphical data input such as handwritten text and the like.

DETDESC:

DETD(5)

Referring to FIG. 1, the overall system organization is clearly shown including the passive tablet 1, the optical stylus 10, communication link 11 connecting the pen to the scan control and scan conversion unit 3. The X-Y data is. . . skilled in the art where this data would subsequently be

utilized for any purpose including regeneration of the image 6 traced out by the stylus. The image 6 is an example of the reproduction on the display of the image 5 traced on the tablet.

DETDESC:

DETD(34)

Each . . . stylus. It will be desired tomaintain uniform grayness across the tablet, at least for the implementation as a transparent overlay

28 DEC 93 15:28:26 U.S. Patent & Trademark Office P0035

US PAT NO: 5,051,736 [IMAGE AVAILABLE] L5: 13 of 28

DETD(34)

digitizer. This can be accomplished by using only those binary codes that have exactly or approximately half zeros and half ones,. . .

DETDESC:

DETD(46)

The . . . about 4 milliseconds (estimated) using presently available digital logic technology. The steps to convert the RAM image into a binary digitizer readout can be done in software in another 4 milliseconds, to achieve a sample rate of 125 pointsper second. If. . .

DETDESC:

DETD(49)

Since the tablet itself is completely passive, this digitizer offers the advantage that the tablet can be placed over any surface. Moreover, multiple tablets may be situated in the. . .

DETDESC:

DETD(95)

To provide an example of the operator of the herein disclosed system, assume a desired digitizer resolution of 50 microns and a tablet size of 1by 1 meter. Using a TAC size of 250 by 250. . .

=>

=> d 15 14 kwic

US PAT NO: 5,007,085 [IMAGE AVAILABLE] L5: 14 of 28

SUMMARY:

BSUM(4)

Various . . . prior art. One of the first devices was the light pen, which is an optical detector in a hand held stylus, which is placed against the face of a cathode ray tube. The location of the light pen is determined by. . . second interactive input device is a opaque graphic tablet, upon

which a sheet of drawing paper might be placed for tracing with a stylus or other instrument. A horizontal wire grid and a vertical wire grid are embedded in the surface of the tablet which are driven with an electromagnetic signal. The computer system establishes the stylus position by receiving the grid signal through the stylus by way of a signal detector.

DETDESC:

DETD(12)

Once the identification interrogation signal is received by the stylus 60, the code generator 127 sends a unique ID code which identifies the stylus 60 and its user in step 145. Once the ID code is received by the infrared receiver 80, the control processor 94 evaluates the stylus ID. If it is an authorized ID code, stylus position sensing mode, locate stylus and

US PAT NO: 5,007,085 [IMAGE AVAILABLE] L5: 14 of 28

DETD(12)

track stylus, is initiated in step 152.

DETDESC:

DETD(16)

Referring . . . bursts in overlay signal are detected by the 40 Khz antenna in the stylus tip 163 and sent to the amplifier/integrator/digitizer 165 which is the only stylus component which remains powered constantly. When the distance between the stylus 160 and overlay. . .

DETDESC:

DETD(17)

When . . . 160 is powered, successive in coming bursts of the the 40 Khz are integrated and digitized by the amplifier integrator digitizer 162. The digitized amplitude value of each burst is sent to the overlay receiver 84 by the modulated carrier signal. . .

DETDESC:

DETD(21)

After the stylus ID has been properly validated, the control processor 94 initiates position sensing. The overlay 20 transmits preset patterns of 40 Khz bursts, first for "locate" and then for "track", from the appropriate x and y conductor groupings. The transmission period for the digitized amplitude values from the stylus 160 will be about 200 microseconds. The shortest period between successive 40 Khz bursts is in "track" mode, 475 microseconds. Each burst takes 125 microseconds, leaving a 350 microsecond interval for transmission. These timings correspond to stylus location sampling of 285 points per second which greatly exceeds the requirements for good reproduction of normal handwriting.

=> d 15 15 wic
'WIC' IS NOT A VALID FORMAT FOR FILE 'USPAT'

```
ENTER DISPLAY FORMAT (CIT):d l5  5     kwic
'D' IS NOT A VALID FORMAT FOR FILE 'USPAT'
'L5' IS NOT A VALID FORMAT FOR FILE 'USPAT'
'5' IS NOT A VALID FORMAT FOR FILE 'USPAT'
YOU HAVE RECEIVED THIS ERROR MESSAGE  2 CONSECUTIVE TIMES

The following are valid formats:

PNO ----- Patent Number
PAT ----- Patent Number, Issue Date, and Current Original
          Reference Classification
CIT ----- Patent Number, Issue Date, Title,
          First Inventor Name, and Current Classifications
LEG ----- Patent Number, Issue Date, Title, Inventor, Assignee,
          Appl. Number, Filing Date, Art Unit, Primary Examiner,
          Legal Rep., Rule 47 Indicator, Attorney Reg. Number
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28 DEC 93 15:30:17           U.S. Patent & Trademark Office          P0037
PCT ----- Alias for the DATE Format
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ALL ----- Entire Patent and Key words assigned
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CLS ----- Patent Number and Current Classification
PN ------ Patent Number
OCC ----- Occurrence Count
AB ------ Abstract
FD ------ Application Filing Date
AD ------ Application Filing Date
AN ------ Application Number
ART ----- Art Unit
AS ------ Assignee Information
ATT ----- Attorney, Agent or Firm
BSUM ---- Summary
CCLS ---- Current Classification
CLMS ---- Claims Information
D371 ---- PCT 371 Date
DD ------ Disclaimer Date
DETD ---- Detail Description
DRWD ---- Drawing Description
E102 ---- PCT 102(e) Date
ECL ----- Exemplary Claim Number
FREF ---- Foreign Patent References Cited
FS ------ Field of Search Subclasses
GI ------ Government Interest Text Data
ICLS ---- Issue Classification
IN ------ Inventor Information
IPC ----- International Classification
OREF ---- Other Publication References Cited
PARN ---- Parent Case Text Data
PD ------ Issue Date
PPDR ---- Number of Drawing Sheets
PPSP ---- Number of Specification Pages
PRIR ---- Foreign Application Priority
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PTAN ---- PCT Number
PTFD ---- PCT Filing Date
PTPD ---- PCT Publication Date
PTPN ---- PCT Publication Number
REI ----- Reissue Data
REL ----- Related Application Data
TERM ---- Term Of Patent
TI ------ Title
UREF ---- U. S. Patent References Cited
XA ------ Assistant Examiner
XP ------ Primary Examiner
KEY ----- Keywords Identified for Patent
IF YOU REQUIRE FURTHER HELP, PLEASE CONTACT YOUR LOCAL HELP DESK
ENTER DISPLAY FORMAT (CIT):xp

US PAT NO: 4,926,010 [IMAGE AVAILABLE] L5: 15 of 28
PRIM-EXMR: Stafford D. Schreyer

=> d 15 15 kwic

US PAT NO: 4,926,010 [IMAGE AVAILABLE] L5: 15 of 28
28 DEC 93 15:31:04 U.S. Patent & Trademark Office P0038

US PAT NO: 4,926,010 [IMAGE AVAILABLE] L5: 15 of 28

SUMMARY:

BSUM(4)

In many computer systems, it has been found desirable to have the capability of also directly entering into the system handwritten and graphical information. This has been accomplished by providing, in addition to the keyboard, a separate input unit which is. . .

SUMMARY:

BSUM(5)

There . . . are disclosed, for example in U.S. Pat. Nos. 4,570,033 and 4,552,991. Units of this type are also sold as so-called "digitizers" by Numonics Corp under Model No. 2210.

DETDESC:

DETD(5)

In . . . of entering alphanumeric and other characters into the computer 10, the keyboard 1 is further adapted to allow entry of handwritten or graphical information. This is accomplished, in accordance with the invention, as can be seen in FIG. 2, by further. . .

DETDESC:

DETD(9)

As . . . signals to be displayed on the display 13. The user is thus provided with visual verification of the path being traced by the stylus

6 in relation to the grid 9 as this graphical information is being stored in the computer 10.

DETDESC:

DETD(12)

The surface 8, when positioned over the keys 3, can be used as a rest or writing surface for the stylus 6 as the user traces the desired pattern. This facilitates making the trace.

DETDESC:

DETD(13)

The . . . the grid 9 and the conversion circuit 7 by utilizing the grid and conversion circuits employed in the aforementioned Numonics digitizer Model No. 2201. Furthermore, the stylus 6 can be the stylus employed in such digitizer.

=> d 15 17 kwic

US PAT NO: 4,883,926 [IMAGE AVAILABLE] L5: 17 of 28
28 DEC 93 15:31:47 U.S. Patent & Trademark Office P0039

US PAT NO: 4,883,926 [IMAGE AVAILABLE] L5: 17 of 28

SUMMARY:

BSUM(5)

For an application such as a digitizer integrated with a display, there is no need for a cursor, since the display appears on the surface of the. . . use when it is desired that the stylus be used to allow the computer to receive an operator's drawing or handwriting.

DETDESC:

DETD(4)

A cross-sectional view of one embodiment of a radial switch stylus constructed in accordance with the teachings of this invention is shown in FIG. 1. Pen down switch contact occurs when conductive annular ring 1 portion of stylus tip 4 touches the conductive inside diameter of stylus housing 2. The diameter 3 of the annular ring is approximately 0.002 inch smaller than the inside diameter of housing 2, requiring only about 0.001 inch radial travel of stylus tip 4 with respect to stylus housing 2 in any direction in order to cause electrical contact to be made between annular ring 1 and the conductive inside diameter of stylus housing 2, thereby causing the pen down switch to be activated. In one embodiment of this invention (FIG. 2), annular ring 1 is formed as an integral part of tip 4; in another embodiment of this invention, stylus tip 4 is an electrically insulating insert as shown in FIG. 1. In one embodiment of this invention, stylus housing 2 is itself conductive, thereby providing an inside diameter which is conductive, forming one contact of the pen down switch. In another embodiment of this invention, stylus housing 2 is made of any convenient material, and the inside of stylus housing 2 is coated with a conductive layer, serving as

one contact of the pen down switch. In an alternative embodiment of this invention, stylus housing 2 is constructed of any convenient material, and an electrically conductive region is formed on the inside of stylus housing 2 surrounding that portion of stylus tip 4, thereby allowing electrical connection when stylus tip 4 is moved in the radial direction. In this embodiment, a wire or another electrically conductive trace formed on the inside of stylus housing 2 is used to connect the pen down switch contact formed on the inside of stylus housing 2 with other circuitry, described later. In alternative embodiments of this invention, annular ring 1 is not formed, or is formed as part of stylus housing 2, the important point being that a means is provided for allowing a slight radial motion of stylus tip 4 with respect to stylus housing 2 to cause closure of a pen down switch.

DETDESC:

DETD(9)

FIG. . . . the point of stylus tip 4 to give an indication of the location of the Stylus point 10 on a digitizer, CRT screen, or the like. As in the embodiment of FIG. 1, the embodiment of FIG. 2 includes stylus housing. . .

=>

=> d l5 18 kwic

US PAT NO: 4,853,493 [IMAGE AVAILABLE] L5: 18 of 28
28 DEC 93 15:32:29 U.S. Patent & Trademark Office P0040

US PAT NO: 4,853,493 [IMAGE AVAILABLE] L5: 18 of 28

SUMMARY:

BSUM(2)

Electrographic . . . design, and computer aided manufacturing systems. As these systems have been improved, a need has been observed for combining hte digitizer funcction with a visual readout such that the operational aspects of vision and information input may be combined to perform. . . and in conjunction with character recognition software. For these advanced aspects of computerized graphics information systems to achieve practicality, the digitizer components of the system must be fabricable on a practical basis with minimal electronic supporting bulk, high noise immunity, high. . .

SUMMARY:

BSUM(3)

The operation of a classic digitizer or graphics tablet has generally involved the utilization by an operator of a stylus or tracer locating device representing a writing instrument which is positioned upon the operational surface and moved across it in some electrical association. The electrographic device responds to the position of this locating stylus or tracer to generate paired analog coordinate signals which are digitized and conveyed to a computer facility. For electronic notepad applications, the computer respojndst othe paired coordinate signals to generate a pixel at a display positioned immediately adjacent the digitizer surface and at the

location of the stylus or tracer. As is apparent, high resolution capabilities are required for such applications.

SUMMARY:

BSUM(4)

Early approaches to digitizer structures looked to arrangements wherein a grid formed of two spaced arrays of mutually, orthogonally disposed fine wires are embedded. . .

SUMMARY:

BSUM(5)

Particularly where applications of combining the digitizer surface with a visual readout are contemplated, the provision of the digitizer surface as a somewhat continuous resistive material shows immediate apparent advantage. Such transparent coatings additionally may be employed with digitizer tablets which are placed over drawings, photographic material, or the like for tracing profiles and generating computer data corresponding therewith.

SUMMARY:

BSUM(6)

A variety of technical problems have been encountered in the development of an effective resistive coating type digitizer technology, one of which concerns the non-uniform nature of the coordinate readouts received from the surfaces. Generally, precise one-to-one correspondence or linearity is required between the actual stylus or tracer position and the resultant

=> d l5 19 kwic

US PAT NO: 4,829,583 [IMAGE AVAILABLE] L5: 19 of 28

SUMMARY:

BSUM(13)

The . . . language. As in linear languages, slight variations in stroke structure which are the natural results of the idiosyncracies of human handwriting are not disidentifying, however.

SUMMARY:

BSUM(15)

The . . . extraordinary efficiency. There is therefore an underlying visual organization principle in all Chinese characters. This principle, called the shorthand visual pattern recognition discriminators, enables the eye to instantly recognize each known character by means of a gestalt right hemisphere brain function without the need to visually trace each stroke. These shorthand visual pattern recognition discriminators are in a most remarkably way superbly fashioned to fully utilize the natural physiology and vision dynamics of. . .

SUMMARY:

BSUM(2)

The main aspect of the device is that it combines the features of a digitizer with those of an X-Y plotter using only one set of servo systems. The present device is an improvement and. . .

SUMMARY:

BSUM(3)

Present . . . lack resolution and they are awkward to use because their writing pen is attached to mechanical linkages. There are no digitizers mentioned in the art at present which are capable of receiving as well as sending information to a computer except for the device in the patent mentioned above. Also, the present-day digitizers are very expensive because they use sophisticated techniques to digitize curves. Another problem is to hold a paper flat against. . .

DETDESC:

DETD(12)

FIG. 8 shows the electical/electronic part of the device in "Send" mode when used as a digitizer for deriving digital x-y coordinates of points on curves traced or written on the device and feeding them to a computer or a tape recorder. When writing or tracing a curve with stylus 5, sensing elements 28 sense the location of the stylus and cause servomotors 41 and 23 to position continuously the sensing elements under stylus 5, thus following its movement as described before. DC voltages produced by potentiometers 44 and 45 are switched alternately by. . . state. Shift register 139 also receives bids from the Q output of JK flip-flop 138 and the switch 95 in stylus 5. The first bid is a flag to tell the computer which channel (x or y) the data are coming from, and the second bid is a flag to tell whether stylus 5 is pressing against the paper or not. Serial data out of shift register 139 and clock pulses from clock. . .

DETDESC:

28 DEC 93 15:34:25 U.S. Patent & Trademark Office P0045

US PAT NO: 4,071,690 [IMAGE AVAILABLE] L5: 28 of 28

DETD(13)

FIG. 9 shows the electrical/electronic part of the device used in "Receive" mode when used as a digitizer. Data from the computer or tape recorder arrive at decoder 141 which changes the data received back into normal format. . .

=> d his

```
     (FILE 'USPAT' ENTERED AT 15:09:22 ON 28 DEC 93)
                SET PAGELENGTH 62
                SET LINELENGTH 78
L1          3256 S DIGITISER# OR DIGITIZER# OR PEN-BASED
L2         18772 S TRAC###(P)(MODEL# OR PATTERN# OR STYLUS OR GESTURE# OR STYL
L3           364 S L1 AND L2
L4          1448 S HANDWRIT####
L5            28 S L3  AND L4

=>
```

INPUT: log y

US PAT NO: 4,814,552 [IMAGE AVAILABLE] L5: 20 of 28

SUMMARY:

BSUM(3)

There has long been a need in the industry for a device for efficiently and conveniently entering handwritten material into a computer. An example of this application would be for a person to sign his name on a. . .

SUMMARY:

BSUM(5)

One . . . and in another December 1986 IEEE C G & A article by Pieter de Bruyne entitled Compact Large Area Graphic Digitizer for Personal Computers. Another is described in U.S. Pat. No. 3,626,483 by Whetstone et al entitled Spark Pen.

DETDESC:

DETD(19)

FIGS. . . . It is possible that as many as four sound receivers would be used, three if the system is designed to track the pointer in three dimensions, and a fourth if it becomes more convenient at some point to encode the switch data onto sound rather than IR pulses. Also, in case the IR line of sight from the stylus to one particular receiver is blocked, it would be convenient to have additional IR recievers. Putting one IR receiver with. . .

=>

=> d l5 28 kwic

US PAT NO: 4,071,690 [IMAGE AVAILABLE] L5: 28 of 28
28 DEC 93 15:34:24 U.S. Patent & Trademark Office P0044

US PAT NO: 4,071,690 [IMAGE AVAILABLE] L5: 28 of 28

ABSTRACT:
This . . . a telautograph to send graphic messages via telephone lines and provide real time graphic communication between two or more stations. Handwriting and sketches or drawings can be sent and received by the same device. A hard copy of the communicated messages. . .

SUMMARY:

BSUM(1)

This . . . over telephone lines in real time, to establish two-way communication with a computer, i.e. it can operate as a curve digitizer but at the same time it can be used as an X-Y plotter to reproduce information outputted by the computer and it can also be used to store graphic information on magnetic tape, such as handwriting and sketches, and in this way to be used as a teaching aid. Finally, it can be used as an. . .

SUMMARY:

BSUM(2)

The main aspect of the device is that it combines the features of a digitizer with those of an X-Y plotter using only one set of servo systems. The present device is an improvement and. . .

SUMMARY:

BSUM(3)

Present . . . lack resolution and they are awkward to use because their writing pen is attached to mechanical linkages. There are no digitizers mentioned in the art at present which are capable of receiving as well as sending information to a computer except for the device in the patent mentioned above. Also, the present-day digitizers are very expensive because they use sophisticated techniques to digitize curves. Another problem is to hold a paper flat against. . .

DETDESC:

DETD(12)

FIG. 8 shows the electical/electronic part of the device in "Send" mode when used as a digitizer for deriving digital x-y coordinates of points on curves traced or written on the device and feeding them to a computer or a tape recorder. When writing or tracing a curve with stylus 5, sensing elements 28 sense the location of the stylus and cause servomotors 41 and 23 to position continuously the sensing elements under stylus 5, thus following its movement as described before. DC voltages produced by potentiometers 44 and 45 are switched alternately by. . . state. Shift register 139 also receives bids from the Q output of JK flip-flop 138 and the switch 95 in stylus 5. The first bid is a flag to tell the computer which channel (x or y) the data are coming from, and the second bid is a flag to tell whether stylus 5 is pressing against the paper or not. Serial data out of shift register 139 and clock pulses from clock. . .

DETDESC:

28 DEC 93 15:34:25 U.S. Patent & Trademark Office P0045

US PAT NO: 4,071,690 [IMAGE AVAILABLE] L5: 28 of 28

DETD(13)

FIG. 9 shows the electrical/electronic part of the device used in "Receive" mode when used as a digitizer. Data from the computer or tape recorder arrive at decoder 141 which changes the data received back into normal format. . .

=> d his

(FILE 'USPAT' ENTERED AT 15:09:22 ON 28 DEC 93)
SET PAGELENGTH 62
SET LINELENGTH 78
L1 3256 S DIGITISER# OR DIGITIZER# OR PEN-BASED
L2 18772 S TRAC###(P)(MODEL# OR PATTERN# OR STYLUS OR GESTURE# OR STYL

```
L3          364 S L1 AND L2
L4         1448 S HANDWRIT####
L5           28 S L3  AND L4

=>
```

28 DEC 93 12:54:20 U.S. Patent & Trademark Office P0001

```
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *                                                                     *
  *           Welcome to MESSENGER at USPTO                             *
  *                                                                     *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *    The USPTO production files are current through:                   *
  *     28 DEC 1993 for U.S. Patent Text Data.                          *
  *     28 DEC 1993 for U.S. Current Classification data.               *
  *     28 DEC 1993 for U.S. Patent Image Data.                         *
  *                                                                     *
  *                                                                     *
  *       * PLEASE USE 305-9000 FOR NEW TELEPHONE NUMBER *              *
  *                                                                     *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *  DISCLAIMER:                                                        *
  *  Neither the United States Government, nor any agency               *
  *  thereof, nor any of their contractors, subcontractors or           *
  *  employees make any warranty, expressed or implied,                 *
  *  including any warranty of marketability of fitness for a           *
  *  particular purpose; nor assumes any legal liability or             *
  *  responsibility for any party's use, or the results of              *
  *  such, of the data.                                                 *
  *                                                                     *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *    There is a new number to call for APS help: 305-9000.            *
  *    The Help Desk staff at this number will handle all APS           *
  *    related questions. Current hours are 6:30 am to 9:00 pm          *
  *    Monday through Friday and 7:30 am to 5:00 pm Saturday.           *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
12:54:20 COPY AND CLEAR PAGE, PLEASE
28 DEC 93 12:54:22 U.S. Patent & Trademark Office P0002
  *    HOURS TO ACCESS MESSENGER ARE 6:30 AM to 9:00 PM                 *
  *    MONDAY THRU FRIDAY AND 7:30 AM to 5:00 PM SATURDAY.              *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
FILE 'USPAT' ENTERED AT 12:54:20 ON 28 DEC 93

  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
  *              W E L C O M E   T O   T H E                          *
  *         U. S.   P A T E N T   T E X T   F I L E                   *
  * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *


=> s pen-based or digitizer#
SEARCH FILE UNAVAILABLE
L1    QUERY CREATED

=> s calculation# or calculator or calculating
SEARCH FILE UNAVAILABLE
L2    QUERY CREATED

=> s calculation# or calculator or calculating
SEARCH FILE UNAVAILABLE
L3    QUERY CREATED

=> s calculation# or calculator or calculating
```

```
         75686 CALCULATION#
          9399 CALCULATOR
         45233 CALCULATING
L4      100149 CALCULATION# OR CALCULATOR OR CALCULATING

=> s  pen-based or digitiser# or digitizer#
         14158 PEN
        428589 BASED
            21 PEN-BASED
                 (PEN(W)BASED)
            80 DIGITISER#
          3173 DIGITIZER#
L5        3256 PEN-BASED OR DIGITISER# OR DIGITIZER#

=> s l5(p)l4
L6         225 L5(P)L4

=> s stylu#(5a)recogniz#####
          7512 STYLU#
        194132 RECOGNIZ#####
L7          33 STYLU#(5A)RECOGNIZ#####

=> s l7(p)l4
L8           2 L7(P)L4

=> d 18  1-2

1.  5,149,919, Sep. 22, 1992, Stylus sensing system; Evon C. Greanias, et
al., 178/19; 345/179 [IMAGE AVAILABLE]

2.  5,117,071, May 26, 1992, Stylus sensing system; Evon C. Greanias, et al.,
28 DEC 93 13:16:00          U.S. Patent & Trademark Office          P0003
178/19; 345/174 [IMAGE AVAILABLE]

=> d 18  1 kwic

US PAT NO:     5,149,919 [IMAGE AVAILABLE]          L8: 1 of 2

DETDESC:

DETD(11)

 FIG. 4 depicts the improved stylus structure of the present invention. In
U.S. Pat. No. 4,686,332, it was recognized the stylus orientation to the
overlay affected the radiative signal amplitude picked up by the stylus.
Signal amplitude variation is accounted for in stylus position determination
by normalizing the signal strength by calculation. Nonetheless, it is
desirable to have the signal amplitude received by the stylus at a given
location on or near.  .  .  orientation has an adverse impact to the contact
detection phase of the improved stylus detection method. Unlike the position
determination calculation, the magnitude of the signal is used without
normalization, as the position calculation is the ratio of several signal
measurements. Finally, it is easier and ultimately more accurate, not to be
required to account by calculation or other means for signal strength
variation due to stylus angle.

=> s handwrit####
```

L9 1448 HANDWRIT####

=> s l9 and l6
L10 8 L9 AND L6

=> d l10 1-8

1. 5,239,489, Aug. 24, 1993, Pen position and tilt estimators for a digitizer tablet; Gregory F. Russell, 364/560; 178/18, 19 [IMAGE AVAILABLE]

2. 5,233,547, Aug. 3, 1993, Electronic checking account apparatus and method having a digitizer to receive information as a check is being written; Michael A. Kapp, et al., 364/705.02; 235/380; 364/709.11 [IMAGE AVAILABLE]

3. 5,198,623, Mar. 30, 1993, Method for use in a digitizer for determining pen tilt; Waldo L. Landmeier, 178/19 [IMAGE AVAILABLE]

4. 5,115,107, May 19, 1992, Method of correcting skew between a digitizer and a digital display; John F. Crooks, et al., 178/18; 345/178; 364/405; 382/45 [IMAGE AVAILABLE]

5. 4,949,279, Aug. 14, 1990, Image processing device; Masaki Takakura, et al., 395/118; 345/162, 186; 395/131 [IMAGE AVAILABLE]

6. 4,817,034, Mar. 28, 1989, Computerized handwriting duplication system; William F. Hardin, Sr., et al., 380/2; 178/18; 345/173; 364/918.7, 919, 919.1, 920.7, 927.1, 927.2, 927.6, 927.61, 929.3, 940.81, 943, 943.5, 951.1, 951.3, 974, DIG.2; 380/13; 382/2, 13 [IMAGE AVAILABLE]

7. 4,730,186, Mar. 8, 1988, Input integrated flat panel display system; Kazuyoshi Koga, et al., 345/179; 178/18; 345/123, 127, 182 [IMAGE AVAILABLE]

8. 4,695,966, Sep. 22, 1987, Image processing device; Masaki Takakura, et al., 395/153; 345/1, 157 [IMAGE AVAILABLE]
28 DEC 93 13:17:57 U.S. Patent & Trademark Office P0004

=> d l10 1 kwic

US PAT NO: 5,239,489 [IMAGE AVAILABLE] L10: 1 of 8

SUMMARY:

BSUM(8)

A . . . conjunction with x-y positional information, may be of considerable value to some users of digitizer tablets, such as automatic on-line handwriting recognition systems.

SUMMARY:

BSUM(16)

In U.S. Pat. No. 4,939,318, issued Jul. 3, 1990, entitled "Digitizer Pen Tilt Correction Employing Wires Near the Data Point" to Watson et al. there is described a digitizer tablet system that employs a method of compensating a calculation of a position of a pen tip. The method includes calculating an approximation to the pen tilt and adding a preestablished

constant that is multiplied by the tilt.

=> d l10 2 kwic

US PAT NO: 5,233,547 [IMAGE AVAILABLE] L10: 2 of 8

SUMMARY:

BSUM(2)

This . . . an electronic checking account apparatus and method, and more particularly relates to such an apparatus and method in which a digitizer is employed to sense information written on a check as it is written, said information being decoded for use in calculation and display of checking account information.

SUMMARY:

BSUM(12)

In . . . the checking account apparatus; memory means coupled to said microprocessor and including checking account information and program means for converting handwritten information into digital information for use by the microprocessor; a display screen coupled to said microprocessor for displaying information related. . .

SUMMARY:

BSUM(13)

In . . . on the check, sensing said written information by the digitizer and decoding said sensed information; and (d) storing the decoded handwritten information in the memory.

SUMMARY:

BSUM(14)

28 DEC 93 13:19:35 U.S. Patent & Trademark Office P0005

US PAT NO: 5,233,547 [IMAGE AVAILABLE] L10: 2 of 8

BSUM(14)
In . . . information on the check, sensing said written information by the digitizer and decoding said sensed information; (e) storing the decoded handwritten information in memory; (f) updating the check register information; and (g) displaying the updated information on the display screen.

DETDESC:

DETD(4)

Other . . . resident ROM. A "scratch pad" memory in the form of the static random access memory SRAM 46 supports algorithms for handwriting conversion to ASCII format, for example. Such handwriting conversion algorithms are well-known.

DETDESC:

DETD(9)

In a second mode of operation, the digitizer 26 functions to transmit pressure-induced signals, in the form of X-Y coordinates, from handwriting on a check 66 (FIG. 2) from the check booklet 28 which is placed on of the digitizer 26. These signals are then converted to ASCII characters using handwriting recognition algorithms stored in memory in the electronic checkbook. Conversion of the operation of the digitizer 26 from the first. . .

DETDESC:

DETD(14)

In block 78, a "default" configuration will appear on the display screen 58 and the digitizer functions which are associated with it will be activated. As an example, let it be assumed that upon successful power-up. . . screen 58 whenever the check record shown in FIG. 2 is not being displayed. As seen in FIG. 1, the digitizer 26 is lying atop the top check 66 of the check booklet 28, and the keyboard layout of the digitizer 26 is thus exposed to view. However only certain ones of the function keys are operative for interacting with the display shown in FIG. 1. Other digitizer keys are active at other times for interacting with other displays which may be presented on the screen 58. Such other displays may, for example, be planners, phone/address, RS232 communications, calculator, alarm clock, note recorder, etc.

DETDESC:

DETD(18)

If . . . digitizer 26 is activated to receive information via the areas under the check payee and amount fields. In addition, the handwriting decoding algorithm is activated (block 120). The user has the freedom of entering either the check amount (block 122) or. . . (block 124) first. In either case, the data from the digitizer 26 is sent to the microcontroller 42 for the handwriting algorithm analysis (block 126). The decoded information is sent to the memory of the smart card 34. A determination is. . .

28 DEC 93 13:19:39 U.S. Patent & Trademark Office P0006

US PAT NO: 5,233,547 [IMAGE AVAILABLE] L10: 2 of 8

DETD(18)

CLAIMS:

CLMS(8)

8. . . .
of the checking account apparatus;
memory means coupled to said microprocessor and including checking account information and program means for converting handwritten information into digital information for use by the microprocessor;
a display screen coupled to said microprocessor for displaying information

related to. . .

CLAIMS:

CLMS(13)

13. . . . of claim 8, in which the memory means includes a static random access memory for supporting algorithms for conversion of handwriting information to a digital format.

CLAIMS:

CLMS(14)

14. The apparatus of claim 12, in which the digital format of the handwriting information is an ASCII format.

CLAIMS:

CLMS(25)

25. . . .
the checking account record apparatus;
memory means coupled to said microprocessor and including checking account information and program means for converting handwritten information into digital information for use by the microprocessor;
a display screen coupled to said microprocessor for displaying information related to. . .

CLAIMS:

CLMS(29)

29. The apparatus of claim 25, in which a handwriting recognition algorithm is included in said memory means.

CLAIMS:

CLMS(33)

33. The apparatus of claim 25, in which said digitizer functions in one mode to receive handwritten information when a check is written, and also functions in a second mode as a keyboard.
28 DEC 93 13:20:09 U.S. Patent & Trademark Office P0007

US PAT NO: 5,233,547 [IMAGE AVAILABLE] L10: 2 of 8

CLMS(33)

CLAIMS:

CLMS(37)

37. . . .
information on the check, sensing said written information by the digitizer and decoding said sensed information; and
(d) storing the decoded handwritten information in the memory.

CLAIMS:

CLMS(40)

40. . . .
appropriate information on the check, sensing said written information by the digitizer and decoding said sensed information;
(e) storing the decoded handwritten information in memory;
(f) updating the check register information; and
(g) displaying the updated information on the display screen.

CLAIMS:

CLMS(46)

46. . . .
on the check, sensing said information by the digitizer and decoding said information sensed by the digitizer;
(g) storing the decoded handwritten information in memory;
(h) updating the check register information; and
(i) displaying the updated information on the display screen.

=> d l10 3 kwic

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L10: 3 of 8

SUMMARY:

BSUM(24)

Alternatively, . . . be used in many applications in and of itself. For instance, this value can be used in security systems employing handwriting recognition to identify personnel, e.g., by the characteristic angle at which individuals hold writing instruments. It can also be used. . .

DETDESC:

DETD(33)

The entries in look-up table 32a can be developed empirically for any particular digitizer. This is achieved by testing the particular digitizer using known stylus angles (e.g., 10.degree., 20.degree., 30.degree., etc.), and thus known tilt ratios that correspond to those angles, and then calculating the field balances in accordance herewith that correspond to those angles and tilt ratios. To save memory space, only positive. . .
28 DEC 93 13:21:03 U.S. Patent & Trademark Office P0008

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L10: 3 of 8

DETD(33)

DETDESC:

DETD(34)

Having . . . known in the art as cyclic errors. Errors of this type can arise out of the approximations used during the calculation steps described above. Since cyclic errors typically are directly related to the inter-conductor spacing, greater spacing can result in larger. . . becomes increasingly important to correct for cyclic error as interconductor spacings increase above about 0.3 inch (0.7 cm). In some digitizers 10 having smaller inter-connector spacings, on the other hand, cyclic error need not be corrected in obtaining a sufficiently accurate. . .

DETDESC:

DETD(43)

Alternatively, . . . stylus in many applications other than in pen-tilt compensation of stylus-position determinations. For instance, this value can be used in handwriting recognition systems, as a parameter in personnel identification, or in electronic calligraphy for determining line thickness. In determining P.sub.E for. . .

CLAIMS:

CLMS(15)

15. In a digitizer including a tablet having an array of conductors, and a pen-shaped, coil-containing stylus, a method of determining a pen-tilt-compensated position. . .
a negative peak, and a zero-crossing therebetween;
C) compensating for pen tilt in determining stylus position on said tablet by
(i) calculating a zero-crossing position value "r" in terms of the voltage "a.sub.0 " corresponding to the conductor next adjacent said zero-crossing. . . the conductor next adjacent said zero-crossing on the other side, and generally in accordance with the equation: r=a.sub.0 /(a.sub.0 +b.sub.0);
(ii) calculating a field balance value f.sub.b generally in accordance with the equation

f.sub.b =v.sub.R /v.sub.L
where

v.sub.L =a.sub.2 +(a.sub.1 -a.sub.2)*r

. . .

CLAIMS:

CLMS(17)

17. The digitizer in accordance with claim 16, wherein the computer means determines the zero-crossing-position value by calculating a zero-crossing position value "r" in terms of the voltage "a.sub.0 " corresponding to the

US PAT NO: 5,198,623 [IMAGE AVAILABLE] L10: 3 of 8

CLMS(17)
conductor next adjacent said zero-crossing. . .

CLAIMS:

CLMS(18)

18. The digitizer in accordance with claim 16, wherein the computer means determines the zero-crossing-position value by calculating said value generally in accordance with the equation:

r=a.sub.0 /(a.sub.0 +b.sub.0).

CLAIMS:

CLMS(19)

19. The digitizer in accordance with claim 16, wherein the computer means further includes
(i) means for calculating a field balance value f.sub.b generally in accordance with the equation

f.sub.b =v.sub.R /v.sub.l
Where

v.sub.L =a.sub.2 +(a.sub.1 -a.sub.2)*r

. . .

=> d l10 4 kwic

US PAT NO: 5,115,107 [IMAGE AVAILABLE] L10: 4 of 8

SUMMARY:

BSUM(5)

In . . . desired that the displayed mark be in exact registration with the stylus, so that the user can make a normal handwritten signature and see it displayed as the writing progresses However, this requires that the digitizer and the display be in. . .

DETDESC:

DETD(9)

FIG. . . . input apparatus 20 is shown in block form in phantom lines, and includes the LCD module 48 and the interactive digitizer element and controller 47, with associated stylus 26. The magnetic stripe reader 32 is shown in a separate phantom line. . . marketed by NCR Corporation, Dayton, Ohio. Personal computer 64 includes a microprocessor (not illustrated) which is programmed to perform the calculations hereinafter discussed. A Display Master model YDM6420 graphics adapter, marketed by Yahama Corporation of America, San Jose, Calif., is incorporated. . .

=> d l10 5 kwic
28 DEC 93 13:22:53 U.S. Patent & Trademark Office P0010

US PAT NO: 4,949,279 [IMAGE AVAILABLE] L10: 5 of 8

DETDESC:

DETD(14)

Examples . . . right at six stages, the pattern A' is a checkered pattern. Locusci 41, 51 which has been inputted by the handwriting inputs are respectively shown in FIG. 6 (b), FIG. 7 (b). The patterns 42, 52 which have been inputted in. . .

DETDESC:

DETD(77)

(2) Calculation scanning. This is a method by which a microprocessor 1 calculates the coordinates of the scanning points in accordance with the coordinates inputted by the use of a digitizer or the like. For example, this is a method of calculating a scanning point P so that points an operator has inputted may be connected with straight lines, of calculating a scanning point P so that the points may be connected with smooth curves or of inputting the center and. . .

DETDESC:

DETD(116)

(b) Calculation scanning. This is a method by which a micro-processor 1 calculates the coordinates of the scanning points in accordance with the coordinates inputted by the use of a digitizer or the like. For example, this is a method of calculating a scanning point P so that points an operator has inputted may be connected with straight lines, of calculating a scanning point P so that the points may be connected with smooth curves or of inputting the center and. . .

DETDESC:

DETD(185)

Then, . . . present invention is different in a shading-off direction, depending upon the scanning direction. In the scanning method, three such as handwriting scanning, calculation scanning, full face scanning may be selected by selection of the scanning method of FIG. 41 flow chart. . .

=> d l10 6 kwic

US PAT NO: 4,817,034 [IMAGE AVAILABLE] L10: 6 of 8
TITLE: Computerized handwriting duplication system

ABSTRACT:
A computerized handwriting duplication system includes a general purpose, programmable, digital microcomputer having a buffer memory, a program memory for a computer program,. . . all coordinate information generated when the cursor pen is out of contact with the digitizer pad; and for smoothing the handwriting by determining new coordinates for all points falling outside a predetermined locus. An X-Y plotter is connected to the microcomputer. . .

SUMMARY:

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US PAT NO: 4,817,034 [IMAGE AVAILABLE] L10: 6 of 8

BSUM(2)

The present invention relates to a system for duplicating handwriting, and in particular relates to a programmed, general purpose digital computer for capturing in memory a digitized handwriting sample, such as a signature, and for driving a plotter to replicate that signature.

SUMMARY:

BSUM(5)

With . . . largely loose their effectiveness unless they were "signed" with an authentic signature. In addition, occasionally there is the desire to handwrite a postscript to the letter below the signature. Obviously, the time requirements for such activity could be prohibitive to the. . .

SUMMARY:

BSUM(6)

This . . . readily portable. Secondly, the machine is fairly limited to a simple signature and thus could not be used also to "handwrite" a message in the form of a note or postscript to a typed letter. Furthermore, these machines are fairly singular. . . the other hand, easy accessibility by authorized persons and easy reproduction of any one of a plurality of signatures or handwritten messages.

SUMMARY:

BSUM(8)

The present invention provides a method and apparatus for replicating a handwritten word at a determinable location on a piece of paper. Such a word can include a person's signature as well as a handwritten note by that person. The present invention utilizes a computer connected to a means for providing a plurality of coordinate points that together represent the handwritten word. In a preferred embodiment, the computer refines the raw data received from the coordinate producing means and provides the refined data to a plotter which replicates the handwritten word at a predetermined location on a piece of paper. The refined data points are stored in a memory that. . .

SUMMARY:

BSUM(9)

Thus, . . . the present invention, the computer program includes a security subroutine which is used to assign a security code to each handwritten word or signature, and which, before it will drive the plotter to replicate the signature requires the correct presentation of. . .

SUMMARY:

BSUM(10)

In a preferred embodiment of the invention, the handwritten word is written on a digitizer pad that produces a plurality of raw coordinates which

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US PAT NO: 4,817,034 [IMAGE AVAILABLE] L10: 6 of 8

BSUM(10)
together represent the handwritten word. The computer operating under the computer program refines the raw coordinate data by adjusting certain data points that fall. . . present invention, the coordinates are produced of a plurality of representative points which when connected by a line replicate a handwritten word. The plurality of point coordinates are stored in a memory of a digital computer. The handwritten word is replicated by providing a piece of paper to a plotter which has a writing implement associated therewith, providing. . . to the plotter so as to drive the plotter and the writing implement from the starting location to produce the handwritten word on the paper.

DETDESC:

DETD(10)

Returning to FIG. 1, computerized handwriting duplication system 10 further comprises two output devices, a video monitor 46 and an X-Y plotter 48. Video monitor 46. . .

DETDESC:

DETD(20)
The point touched on the digitizer pad has now been converted to inches and transformed to the proper X-Y coordinate system. The program checks beginning with program line 12500 whether the point coordinates that have been provided by cursor 22 touching digitizer pad 20 are within the limits of the key pad area. Depending upon which one of a series of IF. . . the appropriate function area and where entries falling near the boundary lines are eliminated. The program lines for making these calculations are as follows:

DETDESC:

DETD(34)

If . . . It is noted that the paper which is fed is usually a typed letter that simply needs a signature or handwritten postscript before it can be sent.

DETDESC:

DETD(43)

Thus, . . . received and the coordinates will be preceded by a "1." When the signer is done with the signature or other handwritten message, cursor 22 is lifted away from being proximate to digitizer pad 20 and the program determines in decision box. . .

CLAIMS:

CLMS(1)

We claim:

1. A method of duplicating handwriting comprising producing a set of a plurality of serial, mutually adjacent coordinates of points of raw data by moving a cursor through a plurality of locations on a digitizer pad to

28 DEC 93 13:23:58 U.S. Patent & Trademark Office P0013

US PAT NO: 4,817,034 [IMAGE AVAILABLE] L10: 6 of 8

CLMS(1)

produce handwriting, said digitizer pad comprising means for detecting said locations and means for generating the coordinates of each location, said coordinates. . . a plurality of representative points which when connected by a line would replicate said cursor movement and thus replicate said handwriting, wherein said cursor can be placed out of proximity of said digitizer's pad, can be placed in proximity, but not. . .

said plurality of point coordinates so as to produce a line connecting together each point coordinate and thus replicating said handwriting.

CLAIMS:

CLMS(2)

2. Apparatus for duplicating a handwritten word, such as a signature, comprising

a digitizer pad;

a cursor having a predetermined origin;

a cursor capable of being moved by. . .

CLAIMS:

CLMS(3)

3. A method of duplicating handwriting comprising:

producing an initial set of a plurality of serial, mutually adjacent coordinates of points of raw data of a handwritten word as the word is being written by moving a cursor through a plurality of locations on a digitizer pad to produce the handwritten word, said digitizer pad comprising means for detecting said locations and means for generating the coordinates of each location, said. . . a plurality of representative points which when connected by a line would replicate said cursor movement and thus replicate said handwriting, said raw data point coordinates being in absolute units from a predetermined origin;

serially storing said set of raw data point. . . as to produce a line connecting together each point coordinate with the point coordinates adjacent thereto and thus repliciting said handwriting.

CLAIMS:

CLMS(4)

4. . . . initially comprises determining new coordinates for those raw data points that are outside a predetermined locus thereby producing a smoothened handwriting word by said driving step.

CLAIMS:

CLMS(6)

6. The method as claimed in claim 3 and further including:
determining the point coordinates of a starting location for said handwriting on a piece of paper; and
directing said writing instrument to begin replicating said handwriting on said paper at said starting location.

=>
=> d l10 7 kwic

US PAT NO: 4,730,186 [IMAGE AVAILABLE] L10: 7 of 8

ABSTRACT:
A system using an input integrated flat panel display of an integrated structure, having an input device for inputting through handwriting characters, graphics, or points and a flat panel display laid upon the input device for displaying in accordance with an input point data input through handwriting. The frame memory of a large screen having a display screen larger than that of the flat panel display is. . .

SUMMARY:

BSUM(4)

The . . . man-machine performance in which an input device and an output device are integrated and the user can input data in handwritten form which is suitable for unskilled or amateur end users not accustomed to keyboards.

SUMMARY:

BSUM(5)

Recently, . . . and OA (Office Automation) apparatuses such as word processors and personal computers have been increasingly employed. Conventionally, in processing data handwritten characters of figures are inputted through an input device such as a digitizer called a "tablet" and the recognized results or handwritings are displayed on an input device, such as a CRT (Cathode Ray Tube) display and then subjected to various processings.. . .

SUMMARY:

BSUM(7)

Apparatuses solving the above problems and improving operational performances are known in: (1) an article entitled "ON-LINE HANDWRITTEN CHINESE CHARACTER RECOGNITION HAVING A TREND OF RELAXING RESTRICTIONS ON THE WAY OF HANDWRITING SUCH AS DEFORMED WRITING CHARACTERS" at pages 115 to 133, Vol. 12.5, 1983, of NIKKEI ELECTRONICS published by Nikkei-McGraw-Hill, Inc.;. . . Laid-Open Publication No. SHO 58-14247 entitled "COORDINATE INPUT DEVICE WITH DISPLAY"; (4) Japanese Patent Laid-Open Publication No. SHO 58-96382 entitled "HANDWRITTEN CHARACTER RECOGNITION AND DISPLAY DEVICE";

and (5) Japanese Patent Laid-Open Publication No. SHO 58-144287 entitled "HANDWRITING INPUT WORD PROCESSOR" wherein there is described a flat panel

US PAT NO: 4,730,186 [IMAGE AVAILABLE] L10: 7 of 8

BSUM(7)
display having a transparent digitizer mounted on the upper face. . .

SUMMARY:

BSUM(12)

Therefore, . . . integrated flat panel display and the highly precise and fine display type CRT for carrying out a subtle processing of handwritten characters or graphics. The reason for this is that the above problems can be solved at once by displaying a. . .

SUMMARY:

BSUM(15)

Further, . . . used as one of the peripheral devices of a multipurpose personal computer and the like, it is possible to process handwritten characters or figures with ease and low cost by simply connecting the flat panel display to the conventional apparatus main. . .

SUMMARY:

BSUM(21)

In an input integrated flat panel display having, in an integrated form, an input device for inputting, through handwriting, characters, graphics, figures or points, and a flat panel display for displaying the input handwritings corresponding to the input coordinate information, the present invention aims at improving the man-machine performance by incorporating the following four. . .

DETDESC:

DETD(14)

A . . . inputting the coordinate is positioned in juxtaposition to the surface of the flat panel display 5 in order to make handwriting input easy.

DETDESC:

DETD(33)

If the digitizer coordinate (X, Y) corresponds to the area of the liquid crystal display section 2, that is, in the case where. . . coordinate (X, Y) is within the range from (XX.sub.min, YY.sub.min) to (XX.sub.max, YY.sub.max), then in order to transform the input digitizer coordinate (X, Y) into the coordinate (x, y) of the frame memory 22, the following calculation is executed, ##EQU2## where a, b, c, and d represent predetermined constants for use in transforming the digitizer coordinate system into the liquid crystal display system, (X.sub.0, X.sub.0) represents

the coordinate given on the scroll appointment area, and. . .

DETDESC:

DETD(75)

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US PAT NO: 4,730,186 [IMAGE AVAILABLE] L10: 7 of 8

DETD(75)
FIG. 15 shows an outer appearance illustrating a general system arrangement for inputting handwriting characters and graphics by using a personal computer. A CRT display 9' with a display resolution of 640.times.400 dots and. . .

DETDESC:

DETD(76)

In . . . of the electromagnetic coupling type digitizer. On the surface of the input integrated flat panel display, there are mounted a handwriting section 12, scroll appointment section 25, and color appointment section 56, all outputs of which are detected on the detection coil printed board 13 of the digitizer. The handwriting section 12 also operates as the liquid crystal display screen, while the scroll appointment section 25 is provided so as. . .

DETDESC:

DETD(81)

First, . . . input pen 1 is checked from the detection coil printed board of the digitizer as to which section among the handwriting input section 12, scroll appointment section 25, and color appointment section 56 includes the input position. Thereafter, particular processings for. . .

DETDESC:

DETD(82)

First of all, if the input coordinate transferred from the digitizer controller 15 is within the handwriting section 12, then the pointed position (X, Y) is transformed into the corresponding display screen coordinate (x, y) of the. . .

CLAIMS:

CLMS(1)

We . . .

panel display system comprising:
an input integrated flat panel display device having an integrated structure, including input means for inputting handwritten data in the form of characters, graphics, and points and a flat display panel integrally combined with said input means for displaying display point data

corresponding to handwritten data input through said input means;
processing means for recognizing whether the display point data relates to characters or graphics and. . . is to be displayed on said flat panel display;
transformation control means connected to said register means for transforming said input handwritten data into display point data for display on a large screen and for transferring said display point data to said. . .

28 DEC 93 13:25:43 U.S. Patent & Trademark Office P0017

US PAT NO: 4,730,186 [IMAGE AVAILABLE] L10: 7 of 8

CLMS(1)

CLAIMS:

CLMS(3)

3. . . . appointment section being integrated with said flat display panel, and further including means for changing the transfer of said input handwritten data to said transformation control means and the extracting of the display point data for said large screen at said. . .

CLAIMS:

CLMS(5)

5. . . . transformation control means including means responsive to said zooming display section for changing the magnification of transformation of said input handwritten data into said display point data for said large screen, and said display control means includes means for extracting a. . .

CLAIMS:

CLMS(6)

6. . . . flat panel display system comprising:
an input integrated flat panel display having an integrated structure, including input means for inputting handwritten data in the form of characters, graphics, and points, and a flat display panel laid upon said input means for. . . for the large screen which is to be displayed on said flat display panel;
transformation control means for transforming said input handwritten data into display point data for said large screen and for transferring said display point data to said processing device. . .

CLAIMS:

CLMS(7)

7. . . . said start address is integrated with said flat display panel, and includes means for changing the transfer of said input handwritten data to said control means and the extracting of the display point data for said large screen at said display. . .

CLAIMS:

CLMS(9)

9. . . . input integrated flat panel display system comprising:
(a) an input integrated flat panel display structure including input means for inputting handwritten data in the form of characters, figures and points and a flat panel display integrated with said input means for displaying an image corresponding to said input handwritten data from said input means;
(b) processor means coupled to said input means for discriminating whether said input handwritten data is a character or a figure and for providing display point data for display by said flat panel display;
28 DEC 93 13:26:15 U.S. Patent & Trademark Office P0018

US PAT NO: 4,730,186 [IMAGE AVAILABLE] L10: 7 of 8

CLMS(9)
(c). . .

CLAIMS:

CLMS(12)

12. . . . data, a display data processing system comprising:
(a) an input integrated flat panel display structure including input means for inputting handwritten data in the form of characters, figures and points, and flat panel display which is smaller than said large image screen and is integrated with said input means for displaying an image corresponding to said handwritten input data as a partial image of an image displayed on the large image screen;
(b) register means responsive to a. . . be displayed on said flat panel display;
(c) first display point data transformation means responsive to said input means for transforming handwritten input data into display point data for the large image screen, based on the start address held in said register.
. .

=>

=> d his

(FILE 'USPAT' ENTERED AT 12:54:20 ON 28 DEC 93)
SET PAGELENGTH 62
SET LINELENGTH 78
L1 QUE PEN-BASED OR DIGITIZER#
L2 QUE CALCULATION# OR CALCULATOR OR CALCULATING
L3 QUE CALCULATION# OR CALCULATOR OR CALCULATING
L4 100149 S CALCULATION# OR CALCULATOR OR CALCULATING
L5 3256 S PEN-BASED OR DIGITISER# OR DIGITIZER#
L6 225 S L5(P)L4
L7 33 S STYLU#(5A)RECOGNIZ#####
L8 2 S L7(P)L4
L9 1448 S HANDWRIT####
L10 8 S L9 AND L6

=> s calculator#(p)l5
11460 CALCULATOR#
L11 83 CALCULATOR#(P)L5

```
=> set highlight off
SET COMMAND COMPLETED

=> s l9 or stylu# or gesture#
          7512 STYLU#
           209 GESTURE#
L12       8929 L9 OR STYLU# OR GESTURE#

=> set highlight on
SET COMMAND COMPLETED

=> s l12 and l11
L13          6 L12 AND L11
28 DEC 93 13:29:40          U.S. Patent & Trademark Office          P0019
=> d l13  1-6
```

1. 5,233,547, Aug. 3, 1993, Electronic checking account apparatus and method having a digitizer to receive information as a check is being written; Michael A. Kapp, et al., 364/705.02; 235/380; 364/709.11 [IMAGE AVAILABLE]

2. 4,758,691, Jul. 19, 1988, Apparatus for determining the position of a movable object; Pieter De Bruyne, 178/19; 367/907 [IMAGE AVAILABLE]

3. 4,716,542, Dec. 29, 1987, Method and apparatus for single source entry of analog and digital data into a computer; Curtis L. Peltz, et al., 345/173; 178/18; 345/168; 364/188, 189, 402, 925.6, 927.92, 927.95, 927.99, 940, 942.1, 942.8, 948.2, 948.21, DIG.2 [IMAGE AVAILABLE]

4. 4,301,326, Nov. 17, 1981, Controllable cursor vacuum hold down; Henry T. Hetzel, et al., 178/18; 248/362 [IMAGE AVAILABLE]

5. 4,255,617, Mar. 10, 1981, Travelling wave digitizer; Frank P. Carau, Sr., et al., 341/5; 178/18, 19; 341/156 [IMAGE AVAILABLE]

6. 4,151,596, Apr. 24, 1979, Calculator interface; Joseph A. Howells, 364/709.11; 345/156; 364/927, 927.1, 927.2, 927.5, 928, 929.2, 937.1, 939, 939.2, 939.3, 942.8, 949, 951.1, 951.4, DIG.2 [IMAGE AVAILABLE]

```
=> d l13  1  kwic

US PAT NO:      5,233,547 [IMAGE AVAILABLE]          L13: 1 of 6

DETDESC:

DETD(14)
```

In block 78, a "default" configuration will appear on the display screen 58 and the digitizer functions which are associated with it will be activated. As an example, let it be assumed that upon successful power-up. . . screen 58 whenever the check record shown in FIG. 2 is not being displayed. As seen in FIG. 1, the digitizer 26 is lying atop the top check 66 of the check booklet 28, and the keyboard layout of the digitizer 26 is thus exposed to view. However only certain ones of the function keys are operative for interacting with the display shown in FIG. 1. Other digitizer keys are active at other times for interacting with other displays which may be presented on the screen 58. Such other displays may, for example, be

planners, phone/address, RS232 communications, calculator, alarm clock, note recorder, etc.

=> d l13 2 kwic

US PAT NO: 4,758,691 [IMAGE AVAILABLE] L13: 2 of 6

ABSTRACT:
The apparatus contains two fixed ultrasound transmitters, an ultrasound receiver forming part of the movable object, and a calculator. A trigger signal from the calculator releases ultrasonic pulses on the ultrasound transmitters and the calculator determines the coordinates of the ultrasound receiver and hence of the movable object from the times required for the ultrasonic. . . and enables precise determination of position and accurate and simple calculation of coordinates and may therefore be used as so-called "digitizer" for geometric data processing.
28 DEC 93 13:30:52 U.S. Patent & Trademark Office P0020

US PAT NO: 4,758,691 [IMAGE AVAILABLE] L13: 2 of 6

CLAIMS:

CLMS(22)

22. Apparatus according to claim 10 for use as a digitizer in combination with a calculator having a keyboard connected through a flexible lead, in particular a personal computer, characterized in that the base station with. . .

=> d l13 3 kwic

US PAT NO: 4,716,542 [IMAGE AVAILABLE] L13: 3 of 6

DETDESC:

DETD(139)

SEND . . . the cursor to the next field on the terminal display screen. It is used primarily to input values from the digitizer into the ACCUBID or other on-screen calculator or into custom formulas in the host computer program, e.g., prestored programs accessed, by marking one of the general function. . .

DETDESC:

DETD(179)

The . . . enter values into quantity fields in the ACCUBID program, and the SEND key is used to input information from the digitizer to the on-screen calculator or into custom formulas.

=> d l13 4 kwic

US PAT NO: 4,301,326 [IMAGE AVAILABLE] L13: 4 of 6

SUMMARY:

BSUM(10)

When a digitizer having the above mentioned attributes is used in conjunction with a controller such as a programmable calculator, desktop computer, or other computer, a number of advantageous operational features may be obtained. These include:

=> d l13 5 kwic

US PAT NO: 4,255,617 [IMAGE AVAILABLE] L13: 5 of 6

DETDESC:

DETD(2)

FIG. 1 shows a digitizer 1 incorporating a swept square wave measurement technique connected to a controller 2. Any of a number of different devices. . . general, the controller would be a computer of either the mini or desktop variety, or it could be a programmable calculator. Other controlling devices are possible; with a suitable interface the digitizer
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US PAT NO: 4,255,617 [IMAGE AVAILABLE] L13: 5 of 6

DETD(2)
can be controlled with a teletype.

DETDESC:

DETD(61)

A . . . is in the name of Jack M. Walden et al., assigned to the Hewlett Packard Company, and is titled "Programmable calculator." Of particular interest are the various figures and their associated text among FIGS. 44 through 127 that describe an entity called the "BPC". The BPC is the processor used in the present digitizer.

=> d l13 6 kwic

US PAT NO: 4,151,596 [IMAGE AVAILABLE] L13: 6 of 6

ABSTRACT:
The invention is applicable for use in conjunction with hand-held calculators, preferably of the type having a substantial computing and programming capability. The calculator typically has a housing, an input keyboard on the housing, a computing module in the housing which includes input terminals. . . with the invention, there is provided an interface for entering numeric information from a companion device, such as a graphical digitizer, into the computing module of the hand-held calculator. The interface includes a multipin connector element affixed to the housing of the calculator and a plurality of conductors for coupling the pins of the connector element to the input terminals of the computing. . . plurality of conductors coupled to the pins of the mate element and adapted for connection to the companion device. The calculator keyboard input to the computing module is typically a one-out-of-N input. The output of a typical graphical digitizer, however, is in binary coded form, with the digits of each binary word running from most-significant to least-significant

positions. In the preferred embodiment of the invention, converter means are coupled between the graphical digitizer and the conductor mate element for converting the binary code to one-out-of-N form.

SUMMARY:

BSUM(3)

In recent years hand-held calculators have come into widespread use. Advances in integrated circuit and microcircuit technology have reduced the cost of calculators having substantial computing and programming ability to the point where technical personnel have such calculators available for individual use. The availability of these calculators has enhanced the efficiency of technical personnel since, for many types of calculations, it is no longer necessary to wait for the availability of larger non-portable computers. However, there are certain aspects of using hand-held calculators which are quite limiting on efficiency. For example, when numerical information is being generated by another device, it is necessary for the user of a hand-held calculator to read the information generated by the companion device and then manually enter the numerical information into the hand-held calculator via the calculator keyboard. One instance where this procedure might be followed is where a hand-held calculator is used to store data and perform calculations on numerical information generated by a graphical digitizer which produces digital information, generally in a

28 DEC 93 13:33:13 U.S. Patent & Trademark Office P0022

US PAT NO: 4,151,596 [IMAGE AVAILABLE] L13: 6 of 6

BSUM(3)
binary coded form, representative of the instantaneous position of a movable element such. . . as a stylus or cursor. In such case, the necessity of having an operator read output information from the graphical digitizer and manually enter such information into a calculator via its keyboard is a relatively slow and inefficient process. Also, this procedure increases the possibility of human error which. . .

SUMMARY:

BSUM(6)

The present invention is applicable for use in conjunction with hand-held calculators, preferably of the type having a substantial computing and programming capability. The calculator typically has a housing, an input keyboard on the housing, a computing module in the housing which includes input terminals. . . with the invention, there is provided an interface for entering numeric information from a companion device, such as a graphical digitizer, into the computing module of the hand-held calculator. The interface includes a multipin connector element affixed to the housing of the calculator and a plurality of conductors for coupling the pins of the connector element to the input terminals of the computing. . .

SUMMARY:

BSUM(7)

The calculator keyboard input to the computing module is typically a one-out-of-N input. The output of a typical graphical digitizer, however,

is in binary coded form (such as binary or binary coded decimal) with the digits of each binary word. . . running from most-significant to least-significant positions. In the preferred embodiment of the invention, converter means are coupled between the graphical digitizer and the conductor mate element for converting the digitizer output to one-out-of-N form.

DRAWING DESC:

DRWD(2)

FIG. 1 illustrates the interface of the invention, as being used in conjunction with a hand-held calculator and a graphical digitizer.

DETDESC:

DETD(2)

Referring to FIG. 1, there is shown a hand-held calculator 20, a graphical digitizer device 30, and the external portions of an interface 50 (within the bracket) in accordance with the invention. The hand-held calculator may be of any suitable type, and preferably has a substantial information storage and computing capability, such as the model SR-59 manufactured by Texas Instruments Corp. The graphical digitizer may be of the type manufactured by Science Accessories Corp. of Southport, Conn., for example the "graf/pen" model GP-3. The calculator 20 includes a housing 21 which has a keyboard 22 and a display 23 thereon. Within housing 21 is a. . .
28 DEC 93 13:33:32 U.S. Patent & Trademark Office P0023

US PAT NO: 4,151,596 [IMAGE AVAILABLE] L13: 6 of 6

DETD(2)

DETDESC:

DETD(4)

In . . . a connector element 51A, of a connector 51, which is affixed to the side of the housing 21 of hand-held calculator 20. This connector element may be either the plug or socket portion of connector 51, the element 51A of the. . . such as the model Mini-PV manufactured by Berg Electronics Corp., and can be affixed to the housing of the hand-held calculator by any suitable technique, such as by use of an epoxy resin. Alternatively, the connector element 51A may be formed integrally with the housing of the hand-held calculator 20. The pins of connector element 51A are coupled, via lines 51D to the input terminals of computing module 25.. . . may be of the type manufactured by Texas Instruments, such as their model SN 5442, converts the information from graphical digitizer 30 into one-out-of-N form that can be utilized by the hand-held calculator 20. The converter 55 can, if desired, be housed within the electronic processing circuitry 35 of the graphical digitizer 30.

DETDESC:

DETD(5)

In operation, the calculator 20 can be utilized in a conventional manner

with the connector socket element 51B disconnected therefrom. When it is desired to input information from the companion device, such as the graphic digitizer 30, the connector socket element 51B is mated to the connector plug element 51A. Typically, if the calculator is of the programmable type, a suitable program will first be entered to prepare for entry of the graphical digital. . .

CLAIMS:

CLMS(3)

3. For use in conjunction with a hand-held calculator having a housing, an input keyboard on said housing, a computing module in said housing including input terminals coupled to. . . said housing coupled to the output of the computing module; an interface for entering numeric information from an independent graphical digitizer into the computing module while maintaining full portability and independent use of said calculator, comprising:
a multipin connector element affixed to the housing of said calculator;
a plurality of conductors for directly coupling pins of said connector element to the numerical input terminals of the computing module,. . . and
a plurality of conductors coupled to the pins of said mate element and adapted for connection to said independent graphical digitizer.

CLAIMS:

CLMS(4)

4. The interface as defined by claim 3 wherein said calculator keyboard input is a one-out-of-N input and said graphical digitizer generates information in binary coded form, and further comprising converter means

28 DEC 93 13:33:58 U.S. Patent & Trademark Office P0024

US PAT NO: 4,151,596 [IMAGE AVAILABLE] L13: 6 of 6

CLMS(4)
coupled between said graphical digitizer and the conductors coupled to said connector mate element for converting the binary code to one-out-of-N form.

=> d his

```
     (FILE 'USPAT' ENTERED AT 12:54:20 ON 28 DEC 93)
                SET PAGELENGTH 62
                SET LINELENGTH 78
L1              QUE PEN-BASED OR DIGITIZER#
L2              QUE CALCULATION# OR CALCULATOR OR CALCULATING
L3              QUE CALCULATION# OR CALCULATOR OR CALCULATING
L4         100149 S CALCULATION# OR CALCULATOR OR CALCULATING
L5           3256 S  PEN-BASED OR DIGITISER# OR DIGITIZER#
L6            225 S L5(P)L4
L7             33 S STYLU#(5A)RECOGNIZ#####
L8              2 S L7(P)L4
L9           1448 S HANDWRIT####
L10             8 S L9 AND L6
L11            83 S CALCULATOR#(P)L5
                SET HIGHLIGHT OFF
L12          8929 S L9 OR STYLU# OR GESTURE#
```

```
                SET HIGHLIGHT ON
L13           6 S L12 AND L11

=>
```